NTNU

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

INTERNATIONAL MASTER´S PROGRAMMES
2007 - 2008

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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, with course descriptions 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 2007/2008.

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 18 000 students, and approximately 3 800 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.

Course code
The course code comprises 6 or 7 digits.

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

Note
This box includes any references to footnotes.

Weekly hours in autumn and spring semesters
The boxes provide information about the weekly number of lessons each semester in each course and which semester the teaching is given.
These weekly hours are divided into:

- F - Lecture hours per week
- Ø - Exercise hours with instruction
- S - Additional hours with self study

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).

Examination
The mark x shows whether the course has an examination or not.

DESCRIPTION OF COURSES FOR THE INTERNATIONAL MASTER´S PROGRAMMES

The description of courses provides a survey of the topics covered in each course. This description also gives the following information:

Course title
The course titles in the course catalogue show:
Complete course title (English)

Course responsibility
This indicates the teacher(s) who is responsible for the teaching etc. and who is the contact person for students and others.

Weekly hours
This provides information about the weekly hours of each course per semester and the semester teaching is given.

Time/venue
Teaching time and location will be announced on the web.

Examination
The examination date and time will be announced on the web.

Examination support
Information about permitted examination support is given at each examination. The following codes are used:

A - All written and handwritten examination support materials are permitted.
All calculators* are permitted.

B - All written and handwritten examination support materials are permitted. Certain, specified calculator** is permitted.

C - Specified written and handwritten examination support materials are permitted. Certain, specified calculator** is permitted.

D - No written or handwritten examination support materials are permitted. Certain, specified calculator** is permitted.

Oral examination has code D unless stated otherwise.

* When "all calculators" are allowed, the following rules apply:
- No possibility of communication with other sources of data is allowed.
- Cannot be connected to mains electricity.
- Is not to make a noise.
- Is not to have any other equipment for reading data than a display.
- Is only to be one - 1 - unit.
- Is only to be pocket sized.
** "Certain, specified calculator" means a calculator with simple, numerical and trigonometrical functions such as +, -, sine, cosine etc. The type of calculator is to be easy for examination invigilators to recognize.
(The specified calculator is HP30S).

Grades: All courses have grades based on the letter scale, where A is the highest passing grade and F is fail.

MSC-PROGRAMME IN COASTAL AND MARINE CIVIL ENGINEERING

This Master of Science degree programme in Coastal and Marine Civil Engineering is an integrated, two year study programme for Norwegian and foreign students. Thus the programme is designed according to the current framework for engineering graduate studies at NTNU.

Norwegian students can enrol in the full M.Sc programme, or select individual courses from the programme in their study curriculum.

Foreign students could be admitted through the Quota Programme, with participants from developing countries and from Central and Eastern Europe. Students with other sources of financing might also be admitted to the full M.Sc programme.

Foreign exchange students could select individual courses from the programme, provided they have the necessary qualifications for the course.

The first year of the study consists of basic compulsory and optional courses on graduate level. The second year provides a specialization in Marine Civil Engineering through a specialization project and subject. In addition one supplementary subject must be chosen. The specialization is supplemented by a non-technical course.

FACULTY OF ENGINEERING SCIENCE AND TECHNOLOGY

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

Term 1, 2, 3 and 4

Ex	Subject no	Subject title	Note	Autumn F	Autumn Ø	Autumn S	Spring F	Spring Ø	Spring S	Cr	Exam
		Compulsory subjects									
1h	TBA4265	MARINE PHYS ENV		3	2	7				7,5	x
1h	TBA4325	SPREAD OF POLLUTION		3	2	7				7,5	x
1v	-	EXP IN TEAM INT PROJ						5	7	7,5	-
1v	TBA4145	PORT/COAST FACILITI					3	2	7	7,5	x
1v	TBA4270	COASTAL ENGINEERING					3	2	7	7,5	x
		Elective subjects (A-list)	1								
1h	TBA4275	DYNAMIC RESPONSE		3	2	7				7,5	x
1h	TBA4305	FREIGHT TRANSP SYST		3	3	6				7,5	x
1h	TBA5100	THEORETICAL SOIL MEC		3	2	7				7,5	x
1h	TFY4300	ENERGY/ENV PHYSICS		4	1	7				7,5	x
1h	TPK4120	SAFETY/RELIAB ANALYS		3	2	7				7,5	x
		Elective subjects (A-list)	2								
1v	AAR4230	PLAN IN DEV COUNTRY					3	1	8	7,5	x
1v	TBA4115	FINITE ELEM GEOTECH					3	5	4	7,5	x
1v	TKT4225	CONCRETE TECHN 2	3				3	2	7	7,5	x
1v	TMR4225	MARINE OPERATIONS					3	6	3	7,5	x
		Specialization	4								
2h	TBA4550	MARINE CIV ENG SP				12				7,5	-
2h	TBA4555	MARINE CIV ENG SC		3	2	7				7,5	x
		Supplementary subjects	5								
2h	TBA4275	DYNAMIC RESPONSE		3	2	7				7,5	x
2h	TBA4305	FREIGHT TRANS SYST		3	3	6				7,5	x
2h	TBA5100	THEORETICAL SOIL MEC		3	2	7				7,5	x
2h	TEP4240	SYSTEM SIMULATION		4	1	7				7,5	x
2h	TFY4300	ENERGY/ENV PHYSICS		4	1	7				7,5	x
2h	TMR4130	RISK SAFETY MAR TRAN		2	8	2				7,5	-
2h	AT327	ARCTIC OFFSHORE ENG	6							10,0	x
		Non-technical subjects	7								
2h	GEOG3506	GEO HEALTH AND DEV		2	1	9				7,5	x
2h	GEOG3561	GENDER SOC CHANGE		2	1	9				7,5	x
		Master Thesis	8								
2v	TBA4920	COAST MAR CIV 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 subjects.
2) Select one of the subjects.
3) Check the recommended previous knowledge in the Study Handbook.
4) Students aiming a specialization in Arctic Marine Civil Engineering might in agreement with the supervising professor take the specialization semester at UNIS, Svalbard.
5) One supplementary subject shall be chosen from the list. Check dates of exam. The courses are not considered when planning the teaching and examination schedules.
6) Two-week intensive course at UNIS, Svalbard. In agreement with the supervising professor. Check date of exam. Numer of participants might be restricted.
7) Select one subject. Other available subjects might be chosen provided approval by professor in charge. Check date of exam.
8) Master thesis should if possible be taken in co-operation with partner institutions. Students aiming a specialization in Arctic Marine Civil Engineering might in agreement with the supervising professor take the Master thesis at UNIS, Svalbard.

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	Autumn F	Autumn Ø	Autumn S	Spring F	Spring Ø	Spring S	Cr	Exam	Comp/ Opt.
		Compulsory and optional courses	1									
1h	TET4115	POWER SYST ANALYSIS		4	4	4				7,5	x	o
1h	TET4160	INSULATING MATERIALS		3	5	4				7,5	x	o
1h	TET4190	POWER ELECTRONICS RE		4	4	4				7,5	x	o
1h	TET5100	POWER ENG UPDATES		4	4	4				7,5	x	o
1v	-	EXP IN TEAM INT PROJ						5	7	7,5	-	v
1v	TEP4220	ENERGY/ENV CONSEQUEN	2				4	1	7	7,5	x	v
1v	TET4120	EL MOTOR DRIVES					4	4	4	7,5	x	v1
1v	TET4135	ENERGY PLANNING					3	4	5	7,5	x	v1
1v	TET4170	EL INSTALLATIONS					3	3	6	7,5	x	v
1v	TET4180	POWER SYST STABILITY					3	6	3	7,5	x	v1
1v	TET4185	POWER MARKETS					3	4	5	7,5	x	v1
1v	TET4195	HIGH VOLTAGE EQUIPM					4	4	4	7,5	x	v1
1v	TET4200	MAR OFF ELECTROINST					4	4	4	7,5	x	v1
2h	TET5500	EL POWER ENG SP				24				15,0	-	o
2h	TET5505	EL POWER ENG SC				12				7,5	x	o
2h	TET4165	LIGHT AND LIGHTING		4	2	6				7,5	x	v
2h	TPK4120	SAFETY/RELIABIL ENG		3	2	7				7,5	x	v
2h	TPK5100	PROJECT MANAGEMENT		3	2	7				7,5	x	v
		Master Thesis										
2v	TET4900	ELEC POW ENG								30,0		o

o - compulsory courses
v - optional courses
v1 - at least three 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) The courses must each semester be selected so that the total weighting amounts to 30 credits (Cr).
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	Autumn F	Autumn Ø	Autumn S	Spring F	Spring Ø	Spring S	Cr	Exam
1h	TBA4110	SOIL INVESTIGATIONS		3	6	3				7,5	x
1h	TBA5100	THEORETICAL SOIL MEC		3	2	7				7,5	x
1h	TBA5150	GEOHAZARDS/RISKAN		3	3	6				7,5	x
1h	TKT4201	STRUCTURAL DYNAMICS		3	3	6				7,5	x
1v	TBA4115	FINITE ELEM GEOTECH					3	5	4	7,5	x
1v	TBA5155	LANDSLIDES AND SLOPE					3	3	6	7,5	x
1v	TGB5110	GEOLOGY TUNNELL BC					4	4	4	7,5	x
1v	TKT4135	MECH OF MATERIALS					3	2	7	7,5	x
2h	TBA4510	GEOTECH ENG SP				12				7,5	-
2h	TBA4515	GEOTECH ENG SC				12				7,5	x
2h	TGB5100	ROCK ENGINEERING AC		3	2	7				7,5	x
2h	-	ELECTIVE COURSE	1							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) 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	Autumn F	Autumn Ø	Autumn S	Spring F	Spring Ø	Spring S	Cr	Exam
1h	TVM5105	HYDROLOGY HYDROP BC		3	4	5				7,5	x
1h	TVM5115	DAM ENGINEERING BC		4	4	4				7,5	x
1h	TVM5125	HYDRAULIC DESIGN BC		4	4	4				7,5	x
1h	TVM5135	PLANN HYDROPOWER BC		4	4	4				7,5	x
1v	TGB5110	GEOLOGY TUNNELL BC					4	4	4	7,5	x
1v	TVM5130	HYDROPOWER PROJECT						12	12	15	-
1v	TVM5140	ENVIRONM/ECONOMI BC					4	4	4	7,5	x
2h	TGB5100	ROCK ENGINEERING AC		3	2	7				7,5	x
2h	TVM5150	HYDROPOWER SIM AC		3	4	5				7,5	x
2h	TVM5160	HEADWORKS AND SED AC		3	2	7				7,5	x
2h	TVM5170	SOCIAL IMPACT ASS AC		3	2	7				7,5	x
		Master Thesis	1								
2v	TVM4915	HYDROPOWER PLANNING								30,0	
2v	TVM4920	HYDROPOWER HYDROLOGY								30,0	
2v	TVM4925	HYDROPOWER HYDRAULIC								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	Autumn			Spring			Cr	Exam	Speciali-zation	
				F	Ø	S	F	Ø	S			1	2
1h	TEP4223	LCA/ECO-EFFICIENCY		4	1	7				7,5	x	o	o
1h	TIØ4195	ENV MAN CORP SOC RES		4	1	7				7,5	x	v	o
1h	TVM4162	INDUSTRIAL ECOLOGY		3	2	7				7,5	x	o	o
1h	POL3507	POLICY ANALYSIS		4		20				15,0	-	v	-
1h	-	OPTIONAL COURSES	1							7,5			
1v	-	EXP IN TEAM INT PROJ						5	7	7,5	-	o	o
1v	TEP4220	ENERGY/ENV CONSEQUEN					4	1	7	7,5	x	o	v
1v	TPD5100	ECODESIGN AC					3	2	7	7,5	x	v	v
1v	TVM4160	MATERIAL FLOW ANALYS					3	2	7	7,5	x	o	v
1v	POL1003	ENVIRONM POLITICS					2	2	8	7,5	x	v	o
1v	POL3507	POLICY ANALYSIS					4		20	15,0	-	-	v
1v	SØK1101	ENVIRONM RESOURCE					2	1	9	7,5	x	v	v
1v	-	OPTIONAL COURSES	1							7,5			
2h	TEP4222	INPUT-OUTPUT ANALYS		2	2	8				7,5	x	v	v
2h	TPK4160	VALUE CHAIN CONTR		3	2	7				7,5	x	v	v
2h	TVM4170	SYSTEMS ANALYSIS		3	2	7				7,5	x	v	v
2h	POL3507	POLICY ANALYSIS		4		20				15,0	-	v	v
2h	-	OPTIONAL COURSES	1							7,5/ 15,0	x	v	v
		Project and thesis preparation course	2										
2h	TEP5100	INDECOL PROJECT				24				15,0	-	v	v
2h	TVM5175	INDECOL PROJECT			12	12				15,0	-	v	v
		Master Thesis	3										
2v	TEP4930	INDUSTRIAL ECOLOGY								30,0			
2v	TVM4930	INDUSTRIAL ECOLOGY								30,0			

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) 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) In the first semester, students will be assigned to an academic supervisor, who is associated with one of many participating departments. 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.
3) Choose one of the thesis codes.

Specialization:
1 Environmental Systems Analysis
2 Environmental Politics and Management

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	Autumn F	Autumn Ø	Autumn S	Spring F	Spring Ø	Spring S	Cr	Exam	Comp/ Opt.
1h	TDT4245	COOPERATION TECHN		3	2	7				7,5	x	o
1h	TDT4250	MODEL-DRIVEN INF SYS		3	2	7				7,5	x	o
1h	TDT4290	CUSTOMER DRIVEN PROJ			2	22				15,0	-	o
1v	-	EXP IN TEAM INT PROJ						5	7	7,5	-	o
1v	TDT4215	WEB INTELLIGENCE					3	2	7	7,5	x	o
1v	TDT4220	COMP SYST PERFO EVAL	1				4	1	7	7,5	x	v
1v	TDT4240	SOFTWARE ARCHITECT	1				3	2	7	7,5	x	v
1v	TDT4280	DISTRIB INT AGENTS	1				2	3	7	7,5	x	v
1v	TIØ4270	HUMAN RES MANAGEMENT	1,2				2	3	7	7,5	x	v
2h	TDT4210	HEALTHCARE INFORM	3	3	2	7				7,5	x	v
2h	TDT4520	PROGR INFO SYST SP				24				15,0	-	o
2h	TDT4525	PROGR INFO SYST SC		2		10				7,5	x	o
2h	TIØ4135	ICT ECONOMICS	3	3	2	7				7,5	x	v
2h	TIØ4180	INNOV/INFO MANAGEM	3	3	2	7				7,5	-	v
2h	POL1004	GLOBALIZATION	3	2	2	8				7,5	x	v
		Master Thesis										
2v	TDT4900	COMPU INFO SCIENCE								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) Two optional courses must be chosen.
2) TIØ4270 will not be taught in 2007/08.
3) One optional course must be chosen.

FACULTY OF NATURAL SCIENCES AND TECHNOLOGY

MSC-PROGRAMME IN LIGHT METALS PRODUCTION
(MSLIMETAL)

Term 1, 2, 3 and 4

Ex	Subject no.	Subject title	Note	Autumn F	Autumn Ø	Autumn S	Spring F	Spring Ø	Spring S	Cr	Exam
1h	TMT4155	HETEROGEN EQUILIBRIA		3	2	7				7,5	x
1h	TMT4185	MATR SCIENCE/ENG		4	2	6				7,5	x
1h	TMT4295	ELECTROLYTIC PROCESS		3	2	7				7,5	x
1h	TMT4325	REFIN/RECYL METALS		3	2	7				7,5	x
1v	TMT4150	REFRACTORIES					4	2	6	7,5	x
1v	TMT4165	MATR/ELECTR CHEM PRO					2	6	4	7,5	-
1v	TMT5100	ELECTR LIGHT MET 2					3	2	7	7,5	x
1v	MT8301	CARBON MAT TECHN					2	2	8	7,5	x
2h	TMT4220	MECH PROP ENG MATR 1		4	1	7				7,5	x
2h	TMT5500	PROC MET ELECTR SP				24				15,0	-
2h	TMT5505	PROC MET ELECTR SC				12				7,5	x
		Master Thesis	1								
2v	TMT4900	MAT CHEM ENER TECHN								30,0	
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) Choose one of the thesis.

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	Autumn F	Autumn Ø	Autumn S	Spring F	Spring Ø	Spring S	Cr	Exam	Specialization 1	Specialization 2
		Compulsory courses											
1h	TMR4175	MARINE STRUCTURES BC	1			12				7,5	x	o	o
1h	TMR4190	ELEM METHODS STRUCT		3	6	3				7,5	x	o	o
1h	TMR4215	SEA LOADS		3	6	3				7,5	x	o	o
1v	TMR4180	MARINE DYNAMICS	1				4	6	2	7,5	x	o	o
1v	TMR4195	DESIGN OFFSHOR STRUC	2				3	6	3	7,5	x	o	v
		Optional courses											
1h	TMR4115	DESIGN METHODS		3	6	3				7,5	x	v	v
1h	TMR4200	FATIGUE/FRACTURE		3	6	3				7,5	x	v	v
1h	TMR4235	STOCH THEORY SEALOAD		3	6	3				7,5	x	v	v
1h	TMR4275	MOD/SIM/AN DYN SYS		3	6	3				7,5	x	-	v
1v	TEP4155	VISC FLOW AND TURB					4	1	7	7,5	x	-	v
1v	TMR4140	DES MAR PROD PLANTS					3	6	3	7,5	x	v	-
1v	TMR4145	PROD MOD DESIGN					2	2	8	7,5	-	v	-
1v	TMR4205	BUCKLING/COLLAPS STR					3	6	3	7,5	x	v	-
1v	TMR4217	HYDRO HIGH-SPEED VEH	2				3	6	3	7,5	x	v	v
1v	TMR4220	NAVAL HYDRODYNAMICS	2				3	6	3	7,5	x	v	v
1v	TMR4225	MARINE OPERATIONS	2				3	6	3	7,5	x	v	v
1v	TMR4230	OCEANOGRAPHY					3	6	3	7,5	x	v	v
		Specialization courses											
2h	TMR4505	MARINE STRUCTURE SC		4	4	4				7,5	x	o	-
2h	TMR4525	MARINE HYDRODYN SC		4	4	4				7,5	x	-	o
		Specialization projects											
2h	TMR4500	MARINE STRUCTURE SP				12				7,5	-	o	-
2h	TMR4520	MARINE HYDRODYN SP				12				7,5	-	-	o
		Supplementary courses	3										
2h	TMR4115	DESIGN METHODS					3	6	3	7,5	x	v	v
2h	TMR4130	RISK ANAL/SAFETY MAN					2	8	2	7,5	-	v	-
2h	TMR4135	FISH VESSEL/WORK DES					2	8	2	7,5	x	v	-
2h	TMR4200	FATIGUE/FRACTURE					3	6	3	7,5	x	v	v
2h	TMR4235	STOCH THEORY SEALOAD					3	6	3	7,5	x	v	v
2h	TMR4275	MOD/SIM/AN DYN SYS					3	6	3	7,5	x	-	v
2h	TMR4300	EXP AND NUM HYDRODYN					4	4	4	7,5	-	-	v
2h	TMR4305	ADV ANAL MAR STRUCT					4	6	2	7,5	x	v	-
		Master Thesis											
2v	TMR4900	MARINE STRUCTURES								30,0		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 two of the courses for specialization in marine hydrodynamics. The students receive further information from their supervisor.
3) Select two supplementary courses. Courses are not considered when planning the teaching and examination schedules.

Specialization:
1. Marine structures
2. Marine hydrodynamics

FACULTY OF ENGINEERING SCIENCE AND TECHNOLOGY

MSC-PROGRAMME IN MARINE TECHNOLOGY (MSN1)

Term 1, 2, 3 and 4

MARINE SYSTEMS ENGINEERING

Ex	Subject no.	Subject title	Note	Autumn F	Autumn Ø	Autumn S	Spring F	Spring Ø	Spring S	Cr	Exam	Specialization 1	Specialization 2	Specialization 3
		Compulsory courses												
1h	TMR4115	DESIGN METHODS		3	6	3				7,5	x	-	v	o
1h	TMR4130	RISK ANALYSIS SAFETY		2	8	2				7,5	-	-	o	v
1h	TMR4223	MARINE MACHINERY	1			12				7,5	x	o	o	v
1h	TMR4253	MARINE SYST DESIGN	1			12				7,5	x	-	o	o
1h	TMR4275	MOD/SIM/AN DYN SYST		3	6	3				7,5	x	o	v	v
1h	TMR4290	DIESEL-EL PROP SYST		3	6	3				7,5	x	o	v	v
1h	TMR4295	DES OF MECH SYST		3	6	3				7,5	x	o	o	-
1v	TMR4265	OPERATION TECHN BC							12	7,5	x	o	o	o
1v	TMR4280	INTERNAL COMB ENGINE					3	6	3	7,5	x	o	v	-
		Optional courses												
1h	TMR4135	FISH VESSEL WORK DES		2	8	2				7,5	x	-	-	v
1h	TMR4175	MARINE STRUCTURE BC				12				7,5	x	-	v	v
1h	TPG5100	MATH/COMPUTER METHOD		2	8	2				7,5	-	-	v	v
1v	TMR4120	UNDERWATER ENG BC					3	6	3	7,5	-	v	v	v
1v	TMR4125	BUILD SHIPS/PLATFORM					3	3	6	7,5	x	v	v	-
1v	TMR4140	DES MAR PROD PLANTS					3	6	3	7,5	x	-	-	v
1v	TMR4145	PROD MOD DESIGN					2	2	8	7,5	-	-	-	v
1v	TMR4180	MARINE DYNAMICS					4	6	2	7,5	x	v	v	v
1v	TMR4220	NAVAL HYDRODYNAMICS					3	6	3	7,5	x	v	-	v
1v	TMR4230	OCEANOGRAPHY					3	6	3	7,5	x	-	-	v
		Specialization courses												
2h	TMR4535	MARINE ENG SC		4	6	2				7,5	x	o	-	-
2h	TMR4555	OPER TECHN SC		4	6	2				7,5	x	-	o	-
2h	TMR4565	DES MAR SYST SC		4	6	2				7,5	x	-	-	o
		Specialization projects												
2h	TMR4530	MARINE ENG SP							12	7,5	-	o	-	-
2h	TMR4550	OPER TECHN SP							12	7,5	-	-	o	-
2h	TMR4560	DES MAR SYST SP							12	7,5	-	-	-	o
		Supplementary courses	2											
2h	TBA4305	FREIGHT TRANSP SYST		3	3	6				7,5	x	-	-	v
2h	TIØ4120	OP RESEARCH INTRO		4	1	7				7,5	x	v	-	-
2h	TMM4165	JOINING TECH		4	1	7				7,5	x	-	-	v
2h	TMR4115	DESIGN METHODS		3	6	3				7,5	x	v	v	-
2h	TMR4130	RISK ANALYSIS SAFETY		2	8	2				7,5	-	-	-	v
2h	TMR4135	FISH VESSEL WORK DES		2	8	2				7,5	x	v	-	-
2h	TMR4137	SUST UTIL MAR RES		4	6	2				7,5	x	-	-	v
2h	TMR4200	FATIGUE/FRACTURE		3	6	3				7,5	x	-	v	v
2h	TMR4215	SEA LOADS		3	6	3				7,5	x	-	v	v
2h	TMR4275	MOD/SIM/AN DYN SYST		3	6	3				7,5	x	-	v	v
2h	TMR4290	DIESEL-EL PROP SYST		3	6	3				7,5	x	-	v	v
		Master Thesis												
2V	TMR4905	MARINE SYST ENG								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

MSC-PROGRAMME IN MARINE TECHNOLOGY - Marine systems is offered every year, starting in August, with preliminary application deadline 1. December the previous year. E-mail and web-site for further information: mscadm@ivt.ntnu.no (http://www.marin.ntnu.no/msc).

Specializations:
1. Marine Engineering
2. Technical Operation of Marine Systems
3. Design of Marine Systems

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) Compulsory for student without the equivalent background.
2) Select two supplementary courses. Courses are not considered when planning the teaching and examination schedules.

FACULTY OF ENGINEERING SCIENCE AND TECHNOLOGY

MSC-PROGRAMME IN MARINE TECHNOLOGY (MSN1)

Term 1, 2, 3 and 4

NAUTICAL SCIENCE

Ex	Subject no.	Subject title	Note	Autumn F	Autumn Ø	Autumn S	Spring F	Spring Ø	Spring S	Cr	Exam
		Compulsory courses									
1h	TMA4120	CALCULUS 4K	1	4	2	6				7,5	x
1h	TMR4215	SEA LOADS		3	6	3				7,5	x
1h	TMR5230	NAUTICAL SCIENCE BC		3	6	3				7,5	x
1h	TTT4140	FUND OF NAVIGATION		4	2	6				7,5	x
1v	TMR4180	MARINE DYNAMICS	1				4	6	2	7,5	x
1v	TTT4150	NAVIGATION SYSTEMS					4	2	6	7,5	x
		Optional courses									
1v	TMR4220	NAVAL HYDRODYNAMICS					3	6	3	7,5	x
1v	TMR4217	HYDRO HIGH-SPEED VEH	2				3	6	3	7,5	x
1v	TMR4225	MARINE OPERATIONS					3	6	3	7,5	x
1v	TMR4230	OCEANOGRAPHY					3	6	3	7,5	x
1v	TMR4240	MARINE CONTROL SYST	3				3	6	3	7,5	x
1v	TTK4105	CONTROL SYSTEMS	4				4	3	5	7,5	x
1v	TTK4190	GUIDANCE AND CONTROL					3	2	7	7,5	x
		Compulsory courses									
2h	TMR5240	NAUTICAL SCIENCE AC		3	6	3				7,5	x
2h	TMR5250	NAUTICAL SC PROJECT			12					7,5	-
2h	TMR5260	NAUTIC SC SPEC SUBJ		2	8	2				7,5	x
		Optional courses									
2h	TMR4130	RISK ANALYSIS SAFETY		2	8	2				7,5	-
2h	TMR4235	STOCH THEORY SEALOAD		3	6	3				7,5	x
2h	TTT4175	MAR ACOUSTICS		4	2	6				7,5	x
		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

MSC-PROGRAMME IN MARINE TECHNOLOGY - Nautical Science, is offered every year. E-mail and web-site for further information: mscadm@ivt.ntnu.no (http://www.marin.ntnu.no/msc).

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	Autumn			Spring			Cr	Exam	Specialization				
				F	Ø	S	F	Ø	S			1	2	3	4	5*
1h	BI3013	EXP CELL BIOLOGY		2	4	6				7,5	x	-	-	-	-	v
1h	FY2302	BIOPHYSICS 1		4	1	7				7,5	-	-	-	-	v	-
1h	IT3604	ORGANIZATION/ICT		2	2	8				7,5	-	-	v	-	-	-
1h	MFEL1010	MED FOR NON MED STUD	1	3	3	6				7,5	x	o	o	o	o	-
1h	MOL3000	INTRO MOL MEDICINE								7,5	x	-	-	-	-	o
1h	MOL3013	MOL PHYSIOLOGY								7,5	x	-	-	-	-	o
1h	TBT4135	BIOPOLYMERS		4	2	6				7,5	x	-	-	-	-	v
1h	TBT4145	MOL GENETICS		4	4	4				7,5	x	-	-	-	-	o
1h	TDT4136	LOGIC/REASONING SYST		3	2	7				7,5	x	-	v	v	-	-
1h	TDT4210	HEALTHCARE INFORM		3	2	7				7,5	x	-	o	v	-	-
1h	TDT4245	COOPERATION TECHN		3	2	7				7,5	x	-	v	-	-	-
1h	TDT4250	MODEL BASED DEV IS		3	2	7				7,5	x	-	v	-	-	-
1h	TFY4225	NUCLEAR/RAD PHYS		4	3	5				7,5	x	-	-	-	o	-
1h	TFY4265	BIOPHYSICAL MICROMET		3	3	6				7,5	x	-	-	-	v	-
1h	TFY4310	MOLECULAR BIOPHYSICS		4	3	5				7,5	x	-	-	-	v	-
1h	TMA4270	MULTIVAR ANALYSIS		4	1	7				7,5	x	-	-	o	-	-
1h	TTK4160	MEDICAL IMAGING		4	4	4				7,5	x	-	-	v	-	-
1h	TTT4125	INFO THEORY COD/COMP		4	1	7				7,5	x	o	-	-	-	-
1h	TTT4130	DIG COMMUNICATION		3	2	7				7,5	x	v	-	-	-	-
1h	TTT4155	REMOTE SENSING		3	2	7				7,5	x	v	-	-	-	-
1h	TTT4175	MARINE ACOUSTICS		4	2	6				7,5	x	v	-	-	-	-
1v	-	EXPH IN TEAM INT PROJ						5	7	7,5	-	o	o	o	o	o
1v	BI2012	CELL BIOLOGY					2	4	6	7,5	x	-	-	-	-	v
1v	BI3018	PAT/COMMERCIALIZAT					2	5	5	7,5	-	-	-	-	-	v
1v	BI3073	GENETIC TOXICOLOGY					2	2	8	7,5	x	-	-	-	-	v
1v	DT8112	RES TOP HEALTH INFO					2	2	8	7,5	-	-	v	-	-	-
1v	IT2801	INFO RETRIEVAL					2	2	8	7,5	x	-	-	v	-	-
1v	MOL4010	MOL BIOL FOR TECH	2				3	3	6	7,5	x	-	-	v	-	-
1v	MOL8002	MOL MECH HOST DEF								9,0	x	-	-	-	-	v
1v	MTEK3001	APPL BIOINFORMATICS					3	3	6	7,5	x	-	-	o	-	-
1v	TDT4213	CLINICAL INFO SYSTEM					3	2	7	7,5	x	-	o	-	-	-
1v	TDT4215	WEB INTELLIGENCE					3	2	7	7,5	x	-	v	-	-	-
1v	TDT4240	SOFTWARE ARCHITECT					3	2	7	7,5	x	-	v	-	-	-
1v	TFY4315	BIOPHYSICS SPECIAL					3	2	7	7,5	x	-	-	-	o	-
1v	TFY4320	MEDICAL PHYSICS					3	2	7	7,5	x	v	-	-	o	-
1v	TKT4150	BIOMECHANICS					4	1	7	7,5	x	-	-	-	v	-
1v	TMA4300	MODERN STAT METHODS					3	2	7	7,5	x	-	-	v	-	-
1v	TTK4165	SIGNAL PROC MED IMAG					2	6	4	7,5	x	o	-	-	-	-
1v	TTK4170	MOD/IDENT BIOL SYS					4	4	4	7,5	x	-	-	-	v	-
1v	TTT4135	MULTIMEDIA SIGN PROC					3	3	6	7,5	x	o	-	-	-	-
1v	TTT4160	MOB COMMUNICATIONS					3	2	7	7,5	x	v	-	-	-	-

cont.

FACULTY OF NATURAL SCIENCES AND TECHNOLOGY

MSC-PROGRAMME IN MEDICAL TECHNOLOGY (MSMEDTEK)

Ex	Subject no.	Subject title	Note	Autumn F	Autumn Ø	Autumn S	Spring F	Spring Ø	Spring S	Cr	Exam	Specialization 1	2	3	4	5*
2h	BI3016	MOLECULAR CELL BIOL		2	2	8				7,5	x	-	-	-	-	o
2h	IT3706	KNOWLEDGE REPR MOD		2	4	6				7,5	x	-	o	-	-	-
2h	TDT4287	ALGORITHMS BIOINFO		2	3	7				7,5	x	-	-	o	-	-
2h	TTK4160	MEDICAL IMAGING		4	4	4				7,5	x	o	-	-	o	-
		Specialization courses														
2h	TBT4505	BIOTECHNOLOGY SC		4	4	4				7,5	x	-	-	-	-	o
2h	TDT4535	BIOINFORMATICS SC		2		10				7,5	x	-	-	o	-	-
2h	TDT4545	HEALTHCARE INFO SC		2		10				7,5	x	-	o	-	-	-
2h	TFY4505	BIOPHYSICS SC				12				7,5	x	-	-	-	o	-
2h	TTK4505	MED CYBERNETICS SC	3			12				7,5	x	v	-	-	-	-
2h	TTT4525	SIGNAL PROC SC	3			12				7,5	x	v	-	-	-	-
		Specialization projects														
2h	TBT4500	BIOTECHNOLOGY SP			10	14				15,0	-	-	-	-	-	o
2h	TDT4530	BIOINFORMATICS SP				24				15,0	-	-	-	o	-	-
2h	TDT4540	HEALTHCARE INFO SP				24				15,0	-	-	o	-	-	-
2h	TFY4500	BIOPHYSICS SP				24				15,0	-	-	-	-	o	-
2h	TTK4500	MED CYBERNETICS SP	3			24				15,0	-	v	-	-	-	-
2h	TTT4520	SIGNAL PROC SP	3			24				15,0	-	v	-	-	-	-
		Master Thesis														
2v	TBT4900	BIOTECHNOLOGY								30,0		-	-	-	-	o
2v	TDT4900	COMP INFORM SCIENCE								30,0		-	o	o	-	-
2v	TFE4900	SIGN PROC COMMUN	4							30,0		v	-	-	-	-
2v	TFY4900	PHYSICS								30,0		-	-	-	o	-
2v	TTK4900	ENGINEERING CYBERN	4							30,0		v	-	-	-	-

* Follows the Examination regulations for the Natural Sciences studies.

o = compulsory subjects
v - optional subjects

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 all lectures are available in English as films through It's learning. In addition all presentations are available as pdf-files at the same site.
2) Lectures are held in Norwegian, but PBL exercises and presentations are given in English.
3) Students at specialization Medical Signal Processing and Imaging should choose one of the combinations TTK4500/ TTK4505 and TTT4520/TTT4525.
4) Students at specialization Medical Signal Processing and Imaging should choose either TFE4900 or TTK4900.

FACULTY OF ENGINEERING SCIENCE AND TECHNOLOGY

MSC-PROGRAMME IN PETROLEUM ENGINEERING AND PETROLEUM GEOSCIENCES

Term 1, 2, 3 and 4

PETROLEUM ENGINEERING (MSG1)

Ex	Subject no.	Subject title	Note	Autumn F	Autumn Ø	Autumn S	Spring F	Spring Ø	Spring S	Cr	Exam	Specialization 1	2	3	4
		Compulsory and optional subjects	1												
1h	TPG4145	RESERVOIR FLUIDS		4	6	2				7,5	x	o	o	v	v
1h	TPG4150	RESERVOIR REC TECHN		4	4	4				7,5	x	o	o	o	o
1h	TPG4177	CARB RESERVOIR CHAR		4	2	6				7,5	x	v	v	v	v
1h	TPG4215	HIGH DEV DRILLING		4	1	7				7,5	x	v	v	o	v
1h	TPG4235	WELL TESTING AC	2	4	1	7				7,5	x	v	v	v	v
1h	TPG5100	MATH/COMPUTER METHOD		2	8	2				7,5	-	o	o	o	o
1h	TPG5120	PETROPHYSICS BC	3	4	2	6				7,5	x	v	v	v	v
1v	TPG4160	RESERVOIR SIMULATION					4	4	4	7,5	x	o	v	v	v
1v	TPG4180	PETR PHYS INTERPR AC	3				4	2	6	7,5	x	v	v	v	o
1v	TPG4205	DRILL TECH PR CONTR					3	1	8	7,5	x	v	v	v	v
1v	TPG4220	DRILLING FLUID					3	1	8	7,5	x	v	v	o	v
1v	TPG4225	FRACTURED RESERVOIR					3	2	7	7,5	x	v	v	v	v
1v	TPG4230	FIELD DEVELOPMENT					3	2	7	7,5	x	v	o	o	o
1v	TPG4240	RESERVOIR EVALUATION					3	1	8	7,5	x	o	v	v	v
1v	TPG5110	PETROLEUM ECONOMICS					3	2	7	7,5	x	v	v	v	v
		Compulsory and optional subjects	4												
2h	TPG4185	FORMATION MECHANICS		3	3	6				7,5	x	v	v	v	v
2h	TPG4235	WELL TESTING AC	2	4	1	7				7,5	x	v	v	v	v
2h	TPG5200	PET ENG/GEO INT PROJ			5	7				7,5	-	v	v	v	v
		Specialization courses	5												
2h	TPG4505	FORM EV-ENG SC				12				7,5	x	-	-	-	o
2h	TPG4515	PETR PROD SC				12				7,5	x	-	o	-	-
2h	TPG4525	DRILLING ENG SC				12				7,5	x	-	-	o	-
2h	TPG4535	RESERVOIR ENG SC				12				7,5	x	o	-	-	-
		Specialization project	6												
2h	TPG4500	FORM EV-ENG SP				24				15,0	-	-	-	-	o
2h	TPG4510	PETR PROD SP				24				15,0	-	-	o	-	-
2h	TPG4520	DRILLING ENG SP				24				15,0	-	-	-	o	-
2h	TPG4530	RESERVOIR ENG SP				24				15,0	-	o	-	-	-
		Master Thesis													
2v	TPG4920	PETROL ENGINEERING								30,0		o	o	o	o

o - compulsory subjects
v - optional subjects

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) Two optional subjects must be chosen in the autumn semester (1h) in specialization 4. In specialization 1, 2 and 3 one optional subject must be chosen. Three optional subjects must be chosen in the spring semester (1v) in specialization 2. Two subjects must be chosen in specialization 1, 3 and 4.
2) Prerequisite: TPG4240 Reservoir Evaluation or and introductory course in well testing.
3) TPG4180 requires TPG5120 or equivalent.
4) One subject must be chosen in the third semeser (2h). In addition to the subjects listed, students can also choose from first semester, Petroleum Engineering and Petroleum Geosciences.
5) One specialization course of 7,5 credit points must be chosen.
6) Specialization projects must be chosen according to elected specialization.

cont.

Specialization:

1. Reservoir Engineering
2. Petroleum Production
3. Drilling Engineering
4. Formation Evaluation

FACULTY OF ENGINEERING SCIENCE AND TECHNOLOGY

MSC-PROGRAMME IN PETROLEUM ENGINEERING AND PETROLEUM GEOSCIENCES

Term 1, 2, 3 and 4

PETROLEUM GEOSCIENCES (MSG2)

Ex	Subject no.	Subject title	Note	Autumn F	Autumn Ø	Autumn S	Spring F	Spring Ø	Spring S	Cr	Exam	Specialization 1	Specialization 2
		Compulsory and optional subjects	1										
1h	TGB4160	PETROLEUM GEOLOGY		3	2	7				7,5	x	v	v
1h	TPG4125	SEISMIC WAVE PROP		4	2	6				7,5	x	o	o
1h	TPG4150	RESERVOIR REC TECHN		4	4	4				7,5	x	v	v
1h	TPG4177	CARB RESERVOIR CHAR		4	2	6				7,5	x	v	v
1h	TPG4185	FORMATION MECHANICS		3	3	6				7,5	x	v	v
1h	TPG4195	GRAVIMETR MAGNETOMET		4	1	7				7,5	x	v	v
1h	TPG5100	MATH/COMPUTER METHOD		2	8	2				7,5	-	o	o
1h	TPG5120	PETROPHYSICS BC	2	4	2	6				7,5	x	v	v
1v	TGB4135	BASIN ANALYSIS					2	3	7	7,5	x	v	v
1v	TGB4170	DIAGENESIS/RESQUAL					2	2	8	7,5	x	v	v
1v	TPG4120	ENG/ENVIRONM GEOPHYS					2	2	8	7,5	x	v	v
1v	TPG4130	SEISMIC INTERPRET					2	3	7	7,5	x	o	o
1v	TPG4170	RESERVOIR SEISMICS					4	1	7	7,5	x	v	v
1v	TPG4180	PETR PHYS INTERPR AC	2				4	2	6	7,5	x	v	v
1v	TPG4240	RESERVOIR EVALUATION					3	1	8	7,5	x	v	v
1v	TPG5110	PETROLEUM ECONOMICS					3	2	7	7,5	x	v	v
2h	TPG4190	SEISMIC DATA		3	2	7				7,5	x	o	v
2h	TPG5200	PET ENG/GEO INT PROJ			5	7				7,5	-	-	v
		Specialization courses	3										
2h	TGB4565	PETR GEOLOGY SC				12				7,5	x	-	o
2h	TPG4545	PETR GEOPHYS SC				12				7,5	x	o	-
		Specialization project	4										
2h	TGB4560	PETR GEOLOGY SP				24				15,0	-	-	o
2h	TPG4540	PETR GEOPHYS SP				24				15,0	-	o	-
		Master Thesis	5										
2v	TGB4915	PETROLEUM GEOSCIENCE								30,0		-	o
2v	TPG4925	PETROLEUM GEOSCIENCE								30,0		o	-

o - compulsory subjects
v - optional subjects

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) Totally four subjects must be chosen each semester. In addition to the subjects (listed 2h) students can choose from 1h Petroleum Engineering, 1h Petroleum Geosciences and PhD-courses if taught in English.
2) TPG4180 requires TPG5120 or equivalent.
3) One specialization course must be chosen, either one topic of 7,5 cr or two topics of 3,75.
4) Specialization projects must be chosen according to elected specialization.
5) The master thesis must be chosen according to elected specialization.

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	Autumn			Spring			Cr	Exam	Comp/ Opt.
				F	Ø	S	F	Ø	S			
1h	TBA5200	PROJECT MANAGEMENT 2		3	2	7				7,5	x	o
1h	TIØ5200	PROJECT MANAGEMENT 3		3	2	7				7,5	x	o
1h	TPK5100	PROJ MANAGEMENT 1		3	2	7				7,5	x	o
1h	TPK5110	QUALITY/RISK MANAGEM		2	3	7				7,5	x	o
1v	-	EXP IN TEAM INT PROJ						5	7	7,5	-	o
1v	TIØ4140	PROJECT EVALUATION	1				3	2	7	7,5	x	v
1v	TIØ4175	IND MANAGEMENT 4C	1				2	3	7	7,5	x	v
1v	TIØ4235	IND MANAGEMENT 4B	1				2	3	7	7,5	-	v
1v	TIØ5210	PROJECT MANAGEMENT 5					3	2	7	7,5	x	o
1v	TIØ5215	PROJECT MANAGEMENT 6					2	3	7	7,5	x	o
		Specialization courses	2									
2h	TBA4535	PRO MAN SC				12				7,5	x	
2h	TIØ5225	PRO MAN SC		2	3	7				7,5	x	
2h	TPK4505	PRO MAN SC				12				7,5	x	
		Specialization projects	3									
2h	TBA4530	PRO MAN SP				24				15,0	-	
2h	TIØ5230	PRO MAN SP				24				15,0	-	
2h	TPK4500	PRO MAN SP				24				15,0	-	
2h	TIØ4265	STRATEGIC MGMT	4	2	3	7				7,5	x	v
		Master Thesis	5									
2v	TBA4910	PROJ MANAGEMENT								30,0		
2v	TIØ4920	PROJ MANAGEMENT								30,0		
2v	TPK4905	PROJ MANAGEMENT								30,0		

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 Theses Spring

1) One of these three are recommended. A technical subject may be chosen.
2) One specialization course must be chosen.
3) One specialization project must be chosen according to elected spesialization course.
4) Students can apply for a technical course instead of this course.
5) Students will normally take their Master thesis in the 4th semester at the same department as their chosen specialization.

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	Autumn F	Autumn Ø	Autumn S	Spring F	Spring Ø	Spring S	Cr	Exam	Comp/ Opt.
1h	TPK4120	SAFETY/RELIABILITY		3	2	7				7,5	x	o
1h	TPK4140	MAIN MANAGEMENT		3	2	7				7,5	x	o
1h	TPK5100	PROJECT MANAGEMENT 1		3	2	7				7,5	x	o
1h	TPK5160	RISK ANALYSIS		3	2	7				7,5	x	o
1v	-	EXP IN TEAM INT PROJ						5	7	7,5	-	o
1v	TIØ4205	SHE-METH/TOOLS SHE	1				4	1	7	7,5	x	v
1v	TMA4255	DESIGN EXP/STAT MET	1				4	1	7	7,5	x	v
1v	TMA4275	LIFETIME ANALYSIS	1				4	1	7	7,5	x	v
1v	TPK5165	RAMS ENG/MANAGEMENT					3	2	7	7,5	x	o
2h	TPK4510	PROD QUALITY ENG SP				24				15,0	-	o
2h	TPK4515	PROD QUALITY ENG SC				12				7,5	x	o
2h	TPK5110	QUALITY/RISK MANAGEM		2	3	7				7,5	x	o
		Master Thesis										
2v	TPK4900	PROD QUALITY ENG								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) Select two of the courses.

COURSES DESCRIPTION OF THE MASTER OF SCIENCE DEGREES IN ENGINEERING

Department of Civil and Transport Engineering

TBA4110 Soil Investigations

Lecturer: Professor II Corneliu Athanasiu, Professor Rolf Birger Sandven
Coordinator: Professor Rolf Birger Sandven
Weekly hours: Autumn: 3F+6Ø+3S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Project work

Learning objectives: The course shall provide a comprehensive knowledge of the mechanical properties of soils, both concerning the theoretical background, as well as field and laboratory methods for determination and interpretation of the soil parameters.
Recommended previous knowledge: The course is based on TBA4100 Geotechnics and Geology and TBA4105 Geotechnics, Design Methods.
Academic content: Need for site characterisation and determination of material properties, field investigations including soundings, sampling and in situ tests, laboratory tests including index testing, tests for determination of stiffness and strength, special laboratory tests and model tests. Planning of site investigation, presentation and evaluation of test results. Short introduction to input parameters for use in finite element analyses.
Teaching methods and activities: The course is based on lectures, practical exercises in the field and laboratory as a part of a site investigation project. Colloquiums with presentation and discussion of test data. The practical exercises and project work are carried out as group work with 2 - 3 students per group. The lectures and exercises are in English when students who do not speak Norwegian take the course. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: Lecture notes are provided from the division.
Assessment: Written examination/Work

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	50/100	D
EXCERCISES		50/100	

TBA4115 Finite Elements in Geotechnical Engineering

Lecturer: Professor II Corneliu Athanasiu, Professor Steinar Nordal
Coordinator: Professor Steinar Nordal
Weekly hours: Spring: 3F+5Ø+4S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Assignments

Learning objectives: The course shall give background knowledge, competence and practical skills in computational geotechnics. As an example, the course will show how we may simulate and visualize an excavation process step by step. We may start with a flat terrain, install a sheet pile wall, excavate, install soil anchors, continue excavation, make the foundations and refill. The on screen visualizations will be used to gain improved geotechnical insight.
Recommended previous knowledge: The course is based on TBA4100 Geotechnical Engineering and Engineering Geology, TBA4105 Geotechnics, Design Methods and TBA4110 Soil Investigations.
Academic content: The course gives a basis for practical use of the Finite Element Method in geotechnical design. The theoretical background of the method is briefly covered. Focus is primarily on basic understanding of soil behavior, problem definition, determination of input soil parameters, evaluation of computed results and comparison to hand calculated estimates. The numerical analyses will cover bearing capacity and settlement of simple and complex foundations, slope stability, retaining structures and buried pipelines. Seepage of water and consolidation with time are dealt with. The lectures are closely related to the exercises.
Teaching methods and activities: The course consists of a combination of conventional lectures and "hands on" exercises using the computer program PLAXIS. The exercises shall normally be made in groups, with two students in each group. Computed results will be discussed in class. Lectures in english. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: Lecture notes from Geotechnical Division, NTNU.
Assessment: Written examination/Midterm/Work

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	50/100	C
MIDTERM EXAMINATION		30/100	C
EXCERCISES		20/100	

TBA4145 Port and Coastal Facilities

Lecturer: Professor II Svein A Fjeld
Weekly hours: Spring: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: To provide applicable knowledge and background for planning, design, construction and operation of marine facilities with focus on concepts and principles involved.
Recommended previous knowledge: TBA4265 Marine Physical Environment and Calculation methods in geotechnical engineering or similar.
Academic content: Guidelines and principles in marine civil engineering. Approach navigation channels, ports and harbours. Terminal facilities. Marine structures in port and coastal engineering; quays, including moorings and fenders, breakwaters, coastal defence works etc. Dredging, handling and deposition of clean and polluted materials.
Teaching methods and activities: Lectures, laborative demonstrations and exercises.The subject is integrated in the MSC program Coastal and Marine Civil Engineering and is taught in English. The midterm examination will only count in a positive direction. If the result of the midterm examination is poorer than the result in the written examination, the final grade will be based on the weighted sum of the written examination (80%) and the midterm examination (20%). If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: Textbook, lecture notes and selected papers.
Assessment: Written examination/Midterm

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	80/100	C
MIDTERM EXAMINATION		20/100	D

TBA4265 Marine Physical Environment

Lecturer: Førsteamanuensis Øivind Asgeir Arntsen, Professor Sveinung Løset
Coordinator: Professor Sveinung Løset
Weekly hours: Autumn: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises and laboratory demonstrations

Learning objectives: The course gives the students the fundamentals of the physical processes that influence the motion in the ocean (wind, waves, tides and currents), from deep water to the coast including the common way of describing these. The students get skills in calculating loads on simple structures due to waves, winds and currents. The course gives the student an understanding of the physical processes leading to the formation of ice, ice features and how to model this and skills in calculating ice actions on structures in offshore cold climate.
Recommended previous knowledge: Basic course in Fluid mechanics and in Statistics. B.Sc in Civil Engineering or similar.
Academic content: Marine physical processes. Description of waves, currents, wind and formation and mechanics of ice. Resulting consequences for marine activities. Fundamentals of statistical methods used in physical marine environment.
Teaching methods and activities: Lectures, laboratory demonstrations and exercises and laboratory exercises. The subject is integrated in the MSC program Coastal and Marine Civil Engineering and is taught in English. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: Information at start of term. Textbook and lecture notes.
Assessment: Written examination/Midterm

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	80/100	C
MIDTERM EXAMINATION		20/100	D

TBA4270 Coastal Engineering

Lecturer: Førsteamanuensis Øivind Asgeir Arntsen
Weekly hours: Spring: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises and laboratory demonstrations

Learning objectives: To give the student a good background for planning and working in the coastal zone, with emphasis on waves towards the coast, sand transport, erosion and scour, and understanding of concepts, definitions and problem issues in conjunction with the coastal zone.
Recommended previous knowledge: TBA4265 Marine Physical Environment or similar.
Basic courses in Fluid dynamics and in Statistics.
Academic content: Use of the coastal zone, planning, environment, rules and guidelines. Description of the coastal zone physical environment; wave transformation, currents, wind, sand transport, erosion and accretion, scour and scour protection.

Teaching methods and activities: Lectures, laboratory demonstrations and exercises.
The subject is integrated in the MSC program Coastal and Marine Civil Engineering and is taught in English. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: Compendium, selected papers.
Assessment: Written examination/Midterm

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	80/100	C
MIDTERM EXAMINATION		20/100	D

TBA4275 Dynamic Response to Irregular Loadings

Lecturer: Førsteamanuensis Øivind Asgeir Arntsen, Professor Geir Moe
Coordinator: Professor Geir Moe
Weekly hours: Autumn: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: Familiarize the students with statistically based methods for description of environmental loading and the resulting response, e.g. structural displacements.
Recommended previous knowledge: The subject is partly based on TBA4265 Marine Physical Environment and TKT4201 Structural Dynamics or equivalent.
Academic content: Natural phenomena such as water waves, wind and earthquakes will be modelled as irregular time series, and these are considered as input to systems that have the corresponding forces as output. On the next level these forces are input in a system in which the displacements of a structure is the output. The relationship from input to output is denoted 'transfer function', and from this follows the response spectrum. Further average frequency, average number of peaks of different magnitude, per time unit, and expected maximum response may be determined.
Teaching methods and activities: Lectures and exercises. The subject is integrated in the MSC program Coastal and Marine Civil Engineering and is taught in English. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: Textbook, compendium, papers.
A. Naess: An Introduction to Random Vibrations, Compendium available at Department of Civil and Transport Engineering. Papers and notes by G. Moe distributed via It's learning.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TBA4305 Freight Transport Systems

Lecturer: Førsteamanuensis Eirin Olaussen Ryeng, Stipendiat Tanu Priya Uteng
Coordinator: Førsteamanuensis Eirin Olaussen Ryeng
Weekly hours: Autumn: 3F+3Ø+6S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: To provide knowledge and understanding of the freight transport systems and their development, as well as the related logistics of the integrated transport chains.
Recommended previous knowledge: None.
Academic content: Infrastructure and markets for all freight transport modes are characterized from the perspectives of logistics and transport economics. Key elements are market development, transport policy, competitive interfaces, organization, and the needs and strategies of the actors responsible for commercial transport functions. Terminals and special features of road, rail, sea, and air transport systems as part of the general logistics and supply chain are considered. Cost-benefit analysis and other methods of transport economics are introduced.
Teaching methods and activities: Lectures, seminars, and exercises. The course is lectured in English. Exercises and final test can be answered in Norwegian. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: Textbook, lecture notes, and selected papers.
Assessment: Written examination/Work

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	60/100	C
EXCERCISES		40/100	

TBA4325 Spreading of Pollution

Lecturer: Førsteamanuensis Øivind Asgeir Arntsen, Professor Sveinung Løset
Coordinator: Professor Sveinung Løset
Weekly hours: Autumn: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.

Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The students will obtain a thorough knowledge on the mechanisms for dispersion and transport of pollution in various recipients (water, soil and air).
Recommended previous knowledge: Elementary knowledge in hydro-dynamics and hydro-geology and statistics.
Academic content: Ocean dispersion, dispersion in the atmosphere and dispersion on the soil. Mixing processes: Spreading by shear, turbulent diffusion, density driven diffusion (in plumes). Statistical methods and modelling. Degradation processes (oil): Evaporation, emulsion formation, dispersion, solubility in water, biological and photo-chemical degradation. Airborne dust: Spreading and retention times.
Teaching methods and activities: Lectures, exercises and colloquia. Two midterm tests will be arranged and 2/3 of the exercises must be passed to get access to the exam. The midterm tests count 25% of the final grade. The course is taught in English. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: Lecture notes and selected papers. To be announced at start of course.
Assessment: Written examination/Midterm

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	75/100	D
MIDTERM EXAMINATION		25/100	D

TBA4510 Geotechnical Engineering, Specialization Project

Lecturer: Professor II Corneliu Athanasiu, Professor Lars Olav Grande, Professor II Farrokh Nadim, Professor Steinar Nordal, Professor Rolf Birger Sandven
Coordinator: Professor Lars Olav Grande
Weekly hours: Autumn: 12S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The students will learn to go deeper into specific areas, using scientific research methods. Critical evaluation of sources, literature and general information shall be combined with own knowledge. Part of the project objective is also to develop ability to work independently, plan the project and report the results according to standards for scientific report writing.
Recommended previous knowledge: Required is at least two of the topics TBA4100 Geotechnical Engineering and Engineering Geology, TBA4105 Geotechnics, Design Methods, TBA4110 Soil Investigations and TBA4115 Finite Elements in Geotechnical Engineering or equivalent.
Academic content: The project work may be of a research nature or it may be organized as a Geotechnical Design Task. This can be together with external business partners or UNIS.
Teaching methods and activities: Independent project work with supervision.
Course materials: Will be listed at the course start.
Assessment: Work

Forms of assessment	Date/Time	Percentage	Exam. support
EXCERCISES		100/100	

TBA4515 Geotechnical Engineering, Specialization Course

Lecturer: Professor II Corneliu Athanasiu, Professor Lars Olav Grande, Professor Steinar Nordal, Professor Rolf Birger Sandven
Coordinator: Professor Lars Olav Grande
Weekly hours: Autumn: 12S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The students will go deeper into the area of geotechnical engineering.
Recommended previous knowledge: Required is at least two of the topics TBA4100 Geotechnical Engineering and Engineering Geology, TBA4105 Geotechnics, Design Methods, TBA4110 Soil Investigations and TBA4115 Finite Elements in Geotechnical Engineering or equivalent.
Academic content: The student shall choose to topics of 3,75 stp from the following list:
Marine geotechnical engineering(3,75 SP).
Elastoplasticity (3,75 SP).
Avalanches and rock falls (3,75 SP).
Advanced field- and laboratory investigations (3,75 SP).
Teaching methods and activities: The teaching consists of laboratory work, lectures, exercises, seminars and self studies. Postponed exam is held within the end of the exam period.
Course materials: Textbooks, handouts and presentations.

Assessment: Oral examination

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	100/100	D

TBA4530 Project Management and Construction Engineering, Specialization Project

Lecturer: Førsteamanuensis Kjell Austeng, Professor Amund Bruland, Professor II Per T Eikeland, Forsker Ola Lædre, Universitetslektor Vegard Olsen, Professor Knut Fredrik Samset, Førsteamanuensis Olav Torp
Coordinator: Førsteamanuensis Olav Torp
Weekly hours: Autumn: 24S = 15.0 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Course in research methods

Learning objectives: The student shall specialise in a selected topic through scientific methods, e.g. collecting knowledge through literature study and information search, field studies at building or construction sites, and combine this with his/her knowledge. The student shall also learn how to perform an independent project work, including project plan with milestones, intermediate reporting and writing reports according to accepted standards.
Recommended previous knowledge: Passed exams in courses on which the project topic and associated theory modules are based.
Academic content: The project topic may be of a reviewing or research type, or connected to a specific building or construction project in the design or construction phase. A short course in research methods is included as a part of the project work. The course must be passed before the specialisation project may be passed. Project topics may be within project management, design management, construction engineering, production technology in building and construction, or combinations of these. The project work may be conducted individually or through student groups, and shall result in a project report. The specialisation project will normally be a pilot study for the following master thesis.
Teaching methods and activities: The project work is performed as an independent work under supervision.
Course materials: Will be given at semester start.
Assessment: Work

Forms of assessment	Date/Time	Percentage	Exam. support
EXCERCISES		100/100	

TBA4535 Project Management and Construction Engineering, Specialization Course

Lecturer: Førsteamanuensis Kjell Austeng, Professor Amund Bruland, Professor II Per T Eikeland, Forsker Ola Lædre, Universitetslektor Vegard Olsen, Professor Knut Fredrik Samset, Førsteamanuensis Olav Torp, Førsteamanuensis Marit Støre Valen
Coordinator: Professor Amund Bruland
Weekly hours: Autumn: 12S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: To convey in-depth knowledge, both theoretical and practical, in a limited field within project management and construction engineering.
Recommended previous knowledge: Passed exams in courses on which the chosen theory themes and associated specialization project topic are based.
Academic content: The course comprises two theory modules of 3.75 credits each. The theory part forms a foundation of the specialization project work, and is closely linked to the project topic. The theory modules are chosen among the following:
Building Rehabilitation (prof. II Svein Bjørberg/ass. prof. Marit Støre Valen).
Facility Management (prof. II Svein Bjørberg/Ass. prof. Marit Støre Valen).
Construction Engineering, surface operations (Ass. Professor V. Olsen).
Construction Engineering, subsurface operations (Prof. A. Bruland).
Production Technology for Building and Construction (prof. A. Bruland).
Front-End Assessment of Projects (prof. K. Samset).
Top Management Structure in Building Projects (prof. II P. Eikeland).
Project Planning under Uncertainty (ass. prof. K. Austeng).
Contract Strategies in Building and Construction Projects (Researcher Ola Lædre).
Special Topic in Building and Construction Engineering (prof. A. Bruland, ass. prof Olav Torp).
Teaching methods and activities: The teaching in the theory modules may be given as lectures, seminars, laboratory teaching or supervised self study. Exercises may be included.
Possible delayed examination will be held within the examination term.
Course materials: Will be given at semester start.
Assessment: Oral examination/Work

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	50/100	D
EXCERCISES		50/100	

TBA4550 Marine Civil Engineering, Specialization Project

Lecturer: Førsteamanuensis Øivind Asgeir Arntsen, Professor II Svein A Fjeld, Professor II Ove Tobias Gudmestad, Professor Sveinung Løset, Professor Geir Moe
Coordinator: Førsteamanuensis Øivind Asgeir Arntsen
Weekly hours: Autumn: 12S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The project will give the student and in-depth knowledge and competence within a selected area of the field of Marine Civil Engineering. The project will improve the ability to do independent engineering/research work, and provide training in planning of projects, systematic processing of information and report writing.
Recommended previous knowledge: Marine Civil Engineering, Spesialization subject, and fundamental courses required for the project.
Academic content: The project work is related to research and/or development within a chosen area. The project may comprise theoretical, numerical, experimental or field studies. The specialization project will normally be a starting point for the thesis works in the spring term. The student can work individually or in team.
Course materials: To be decided according to type of project.
Assessment: Work

Forms of assessment	Date/Time	Percentage	Exam. support
EXCERCISES		100/100	

TBA4555 Marine Civil Engineering, Specialization Course

Lecturer: Førsteamanuensis Øivind Asgeir Arntsen, Professor Geir Moe
Coordinator: Førsteamanuensis Øivind Asgeir Arntsen
Weekly hours: Autumn: 12S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The project will give the student an in-depth knowledge and competence within the two important fields of Marine Civil Engineering today.
Recommended previous knowledge: TBA4265 Marine Physical Environment or similar. One of the subjects TBA4145 Port and Coastal Facilities and TBA4270 Coastal Engineering or similar.
Academic content: The subject consists of two topics each of 3.75 stp (ECTS):
Flowinduced vibrations (Professor Geir Moe).
Coastal Engineering II (Førsteamanuensis Øivind A. Arntsen).
Teaching methods and activities: The two topics are taught separately in form of lectures, assignmnets and self studies. If required a re-sit examination will be held at the end of the examination period for which the examination form may be changed from written to oral.
Course materials: Compendia, selected reports and scientific papers. Will be stated at the beginning of the term.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TBA5100 Theoretical Soil Mechanics

Lecturer: Amanuensis Arnfinn Emdal, Professor Lars Olav Grande
Coordinator: Professor Lars Olav Grande
Weekly hours: Autumn: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Assignments

Learning objectives: The course is designed to give thorough theoretical background for the geotechnical design methods for slope stability, earth pressure, bearing capacity of foundations and piles as well as assessments of settlements and displacements.
Recommended previous knowledge: B.Sc degree in Civil Engineering or equivalent. Basic courses in geology and geotechnics.
Academic content: Theoretical background for the calculation methods used in geotechnical engineering. Relevant stress fields based on the theory of plasticity, basic elements and combinations. Principles and recipes for performing short-hand calculations of settlements, slope stability, earth pressure and bearning capacity of foundations and piles. The course aims at creating understanding through classical analysing tools and hand calculations as well as demonstrations of real design cases.
Teaching methods and activities: Lectures, calculation and laboratory exercises. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: Information at start of term, lecture notes.

Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TBA5150 Geohazards and Risk Analysis

Lecturer: Professor II Farrokh Nadim
Weekly hours: Autumn: 3F+3Ø+6S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Assignments

Learning objectives: Soils and rocks are among the most variable of all engineering materials, and as such they are highly amenable to a probabilistic treatment. The main objective of the course is to present a state-of-the-art training on probabilistic techniques applied to geotechnical engineering in relation to both theory and practice. Special emphasis will be on problems related to geohazards, e.g. earthquakes and landslides.
Recommended previous knowledge: BSc degree in Civil Engineering or equivalent. Basic courses in geology and geotechnics. Introductory understanding of probability and statistics.
Academic content: The course will include: (a) terminology used in risk assessment, (b) discussion of the sources and types of uncertainties in problems related to geohazards, (c) discussion of the potential benefits of a probabilistic approach as opposed to the classical "Factor Of Safety" method in geotechnical analysis, (d) review relevant statistical and probabilistic theories needed to develop the methodologies and to interprete the results of the probabilistic analyses, and (e) describe some well established methods of probabilistic analysis as applied to geotechnical analysis, such as First Order Second Moment (FOSM) method and the First Order Reliability Method (FORM), event tree and logic tree construction, reliability of "systems".
Teaching methods and activities: Lecture, term project, assignments.
Course materials: Lecture notes presented by the geotechnical division.
Assessment: Oral examination/Work

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	50/100	D
EXCERCISES		50/100	

TBA5155 Landslides and Slope Stability

Lecturer: Professor Lars Olav Grande
Weekly hours: Spring: 3F+3Ø+6S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: This course will be focusing on the stability of natural slopes and stability considerations related to manmade cuts or fills. Focus will be on the conditions up until a slide is initiated, leaving out the post-failure description and modelling of mass transport.
Recommended previous knowledge: BSc in Civil Engineering or equivalent. The course is based on TBA4100 Geotechnical Engineering and Engineering Geology and TBA5100 Theoretical Soil Mechanics and TBA4110 Soil Investigations or equivalent.
Academic content: Theory and principles of slope stability evaluation will be covered in detail, ranging from simple methods for hand calculations to finite element simulations. Factors influencing stability will be studied. A thorough presentation of international case records will be included. An introduction to submarine slides, effect of earthquakes and non-saturated soil will be given. Both deterministic and probabilistic approach will be covered.
Teaching methods and activities: Lectures, project work with practical field and laboratory exercises. Calculation by hand and by use of FEM-code PLAXIS. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: Lecture notes from the geotechnical division.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TBA5200 Project Management 2 - Front End Planning and Control

Lecturer: Førsteamanuensis Kjell Austeng, Forsker Ola Lædre, Professor II Bjørn Svensvik, Førsteamanuensis Olav Torp
Coordinator: Førsteamanuensis Kjell Austeng
Weekly hours: Autumn: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises, Semester paper

Learning objectives: To understand the project context and the constraints regarding to the factors for success or failure. How to develop the project from need and objectives to concept and real plans, and how to manage the performance including contracts, change and risk.
Recommended previous knowledge: Project Planning and Control 1 or similar.

Academic content: Project success and failure, project context and stakeholders, assessment of needs, objectives and effects, risks and opportunities, project mandate and basic design, estimating costs and revenues, contractual aspects, health and safety mainstreaming, strategic and tactical management, project performance management and evaluation, flexibility and change, project close-out.
Teaching methods and activities: One written assignment. (Group work). Portfolio assessment is the basis for the grade in the course. The portfolio includes a final written exam (50%) and assignment/exercises (50%). The results for the parts are given in %-scores, while the entire portfolio is assigned a letter grade. Postponed/repeated exams may be oral.
Course materials: To be announced.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	50/100	A
EXCERCISES		50/100	

Department of Biotechnology

TBT4135 Biopolymers

Lecturer: Professor Bjørn Erik Christensen
Weekly hours: Autumn: 4F+2Ø+6S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Laboratory exercises, Calculation exercises

Learning objectives: Basic knowledge on chemical structure, physical properties, biological functions and technological applications of biologically and technologically important biopolymers.
Recommended previous knowledge: Basic knowledge in organic chemistry, physical chemistry and biochemistry. Due to limited capacity, permission of the department is required for students not registered in Dept. of Biotechnology.
Academic content: Chemical structure with emphasis on polysaccharides. Physical dimensions and chain flexibility/stiffness. Conformational states and transitions. Molecular weight distributions. Thermodynamic properties with main emphasis on polyelectrolytes. Theoretical basis and laboratory exercises related to experimental methods: Viscosity and intrinsic viscosity, analytical ultracentrifuge, light scattering and chromatographic methods.
Teaching methods and activities: Lectures, theoretical exercises, laboratory work. The course will be given in English if international master students are taking the course. Exam: Written. The midterm test (semesterprøve) is optional and will only count in positive direction. If the test is not submitted or the result is lower than that obtained on the final exam, the grade obtained in this course will only be based on the final exam. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: Book: O. Smidsrød og S. T. Moe: Biopolymerkjemi, Tapir (Norwegian only), 1995. B.E. Christensen: Tilleggskompendium i Biopolymerkjemi. Some additional material.
Assessment: Written examination/Midterm

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	70/100	D
MIDTERM EXAMINATION		30/100	D

TBT4145 Molecular Genetics

Lecturer: Professor Svein Valla
Weekly hours: Autumn: 4F+4Ø+4S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: To understand how the genetic information in prokaryote and eukaryote organisms are organized and expressed and to achieve basic knowledge about the methods needed in order to study this. The students should also obtain a basic understanding as to how this knowledge is used in applied biotechnology, and be able to suggest experimental solutions to common problems occurring in basic and applied genetic research.
Recommended previous knowledge: Background in biochemistry basic and advanced course (TBT4100 and TBT4105). Due to limited capacity, permission of the department is required for students not registered in Dept. of Biotechnology.
Academic content: The course aims at providing an introduction to the basic principles of the molecular genetics of prokaryotic and eukaryotic organisms. The main areas of recombinant DNA technology applications will also be covered. Examples of important topics that will be discussed are: gene organization in pro- and eukaryotes, regulation of transcription and translation, techniques in recombinant DNA technology, plasmid biology and biotechnolgical applications of this knowledge.
Teaching methods and activities: Lectures, laboratory work. The course will be given in English if international master students are taking the course. If there is a re-sit examination, the examination form may change from written to oral.
Course materials: Is specified at the beginning of the course.

Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TBT4500 Biotechnology, Specialization Project

Lecturer: Førsteamanuensis Per Bruheim
Weekly hours: Autumn: 10Ø+14S = 15.0 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The aim is that the students shall gain theoretical knowledge and experimental experience within central topics of biotechnology. They shall also gain experience in project planning, collection of scientific information, and oral and written presentations.
Recommended previous knowledge: Previous knowledge in biochemistry, microbiology, biochemical engineering, and molecular genetics is required; e.g. corresponding to the courses TBT4105, TBT4110, TBT4140 and TBT4145.
Academic content: The students shall carry out a laboratory project work connected to research programs in biopolymer chemistry, molecular genetic, microbiology, biochemical engineering, environmental biotechnology or food science.
Teaching methods and activities: The laboratory project work is carried out individually or in small groups of students (normally two) under the supervision of a professor.
Course materials: Information is given in the beginning of the course.
Assessment: Work

Forms of assessment	Date/Time	Percentage	Exam. support
EXCERCISES		100/100	

TBT4505 Biotechnology, Specialization Course

Lecturer: Førsteamanuensis Per Bruheim
Weekly hours: Autumn: 4F+4Ø+4S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The aim is that the students shall gain theoretical knowledge within central topics of biotechnology.
Recommended previous knowledge: Previous knowledge in biochemistry, microbiology, biochemical engineering, and molecular genetics is required; e.g. corresponding to the courses TBT4105, TBT4110, TBT4140 and TBT4145.
Academic content: Each student select two courses. The following courses (3.75 sp) are taught by the biotechnology department: Statistics and research planning (T. Rustad), Chitin and chitosan (K.M. Vårum), Biopolymer materials (K.I.Draget), Metabolic engineering (P.Bruheim), Immobilized cells and enzymes (G.Skjåk-Bræk), Bioinformatics (S.Valla) and Practical NMR-spectroscopy (A. Dikyi). Courses (3.75 sp) offered by other departments are: Physiology and Programming of Bioinformatics.
Teaching methods and activities: The teaching of the courses may include lectures, study groups, self-tuition, written reports and oral presentation. The course will be given in english if international master students are taking the course. Delayed exams are held in the same exam period.
Course materials: Information is given in the beginning of the course.
Assessment: Oral examination

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	100/100	D

Department of Computer and Information Science

TDT4136 Logic and Reasoning Systems

Lecturer: Førsteamanuensis Tore Amble
Weekly hours: Autumn: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The subject shall give a general introduction to Artificial Intelligence (AI), and its basis is taken from mathematics, logic and cognitive sciences. The subject aims at realising aspects of intelligent behaviour in computer systems.
Recommended previous knowledge: IT1105 Algorithms and Data Structures (see catalogue 2006/07) /TDT 4120 Algorithms and Data Structures. MA0301 Elemantary Discrete Mathematics/MA0302 Discrete Mathematics (see catalogue 2006/07), or similar.
Academic content: The subject starts with a description of problem solving methods by means of heuristic search. Therafter, various knowledge representation languages and inference methods for automatic problem solving. Representation in form of predicate logic, frames and semantic nets are treated, and connected to the main forms of reasoning - especially rule based

reasoning. Furthermore, architectures that integrates various resoning methods, agent based architectures and architectures for interactive problem solving. Numerous applicaton examples are given to demonstrate the methods.
Teaching methods and activities: Lectures, self study and exercises. A number of mandatory exercises must be approved in order to take the exam. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: Stuart Russel, Peter Norvig: Artificial Intelligence. A Modern Approach, Second Edition, Prentice Hall, 2003.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TDT4210 Healthcare Informatics

Lecturer: Førsteamanuensis Øystein Nytrø
Weekly hours: Autumn: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: To give insight in, and understanding of the particular requirements to information systems, and information- and knowledge management, in the health services.
Recommended previous knowledge: Some knowledge about medicine and healthcare. Basic informatics competence, including software engineering, information systems and modelling.
Academic content: The health services sector is very information- and knowledge intensive. In addition, it is exceptionally large, complex and dynamic. The computerized patient record is an important clinical tool, and its content, structure and usage is discussed i depth. Further themes are coding, record standards, plans, requirements and legal issues, functionality, usability, computer-supported cooperation, decision support and guidelines.
Teaching methods and activities: Lectures, programming laboratory, projects, theoretical assignments. The final grade will be the result of a 'port-folio' evaluation, where the final exam will have 70% weight and other work 30%. The parts will be graded on a 0 - 100 points scale, the weighted result will be on the usal A - F scale. The course can be held in English if international students attend. Postponed/repeated exams may be oral.
Course materials: Textbook, articles, lecture notes and other material.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	70/100	D
EXCERCISES		30/100	

TDT4213 Clinical Information Systems

Lecturer: Førsteamanuensis Øystein Nytrø
Weekly hours: Spring: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Project, laboratory

Learning objectives: Detailed knowledge about standards, non-standards and ongoing standardization efforts. Theoretical knowledge, and practical experience, in using and adapting various methods and theories. Practical experience with selected clinical situations and systems.
Recommended previous knowledge: Bachelor degree in informatics or similar. TDT4210 Healthcare Informatics or similar. MFEL1010 Medicine for Non-Medical Students or similar.
Academic content: The course will give knowledge and practical experience with methods and theory for developing clinical information-, knowledge- and cooperation systems. Examples and laboratory work will as far as possible be related to ongoing national or international research or development projects. Particular topics are: National and international standards for storage and exchange of information and knowledge. Architecture of heterogeneous and distributed systems. Methods for observation, development, evaluation and analysis of information and communication processes and information use in healthcare services. Encoding and representation of clinical knowledge and information.
Teaching methods and activities: Lectures and programming laboratory. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: Research papers and reports.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	70/100	D
EXCERCISES		30/100	

TDT4215 Web Intelligence

Lecturer: Professor Jon Atle Gulla
Weekly hours: Spring: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.

Grade: Letter grade Compulsory assignments: None

Learning objectives: The students will understand how textual document collections are used in organizations and what role they are given in the management of organizational knowledge. They should know the techniques for document retrieval and knowledge discovery in large document collections. There is an overview of how documents may be analysed semantically with respect to categorization, concept extraction, and knowledge management. Some specific problems associated with documents and services on the web will also be discussed.
Recommended previous knowledge: Course TDT4175 Information Systems, or equivalent.
Academic content: Information retrieval in textual document collections. Search engines. Linguistic and statistical techniques for text mining. Text categorization, clustering, collocations, and concept extraction. Ontologies in knowledge management. Semantic applications. Semantic web.
Teaching methods and activities: Lectures and exercises. The course may be taught in English if taken by students without Norwegian language skills. Portfolio assessment is the basis for the grade in the course. The portfolio includes a final written test (60%) and exercises (40%). The results for the parts are given in %-scores, while the entire portfolio is assigned a letter grade. In case of delayed exam (continuation exam) the final written test may be replaced by an oral test.
Course materials: Announced at start of semester.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	60/100	D
EXCERCISES		40/100	

TDT4220 Computer Systems Performance Evaluation

Lecturer: Professor Peter Henry Hughes
Weekly hours: Spring: 4F+1Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The course provides an introduction to quantitative methods for the design, sizing and analysis of computer systems. In the exercises, students learn how to apply these methods with the help of generic examples.
Recommended previous knowledge: Knowledge of Computer science and Statistics corresponding to the first five semesters of the Masters programme in Computer Science.
Academic content: An introduction to quantitative methods for the design, sizing and analysis of computer systems. This will include: basic concepts; measurement techniques; workload characterisation; static and dynamic models; elementary queuing networks and discrete-event simulation. Applications will address performance requirements during both system development and operation
Teaching methods and activities: Lectures and exercises. Students take an obligatory mid-term test which gives feedback on progress. The course can be given in English if it is taken by students without sufficient knowledge of Norwegian. The final character is based on a portfolio evaluation. Grades for the separate parts are given in percentage points whereas the overall grade is given as a character. In the event of postponement or re-sit (so-called 'kontinuasjonseksamen') the written examination can be changed to an oral examination.
Course materials: Provided at the start of the semester.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	80/100	C
EXCERCISES		20/100	

TDT4240 Software Architecture

Lecturer: Professor Maria Letizia Jaccheri, Førsteamanuensis Alf Inge Wang
Coordinator: Førsteamanuensis Alf Inge Wang
Weekly hours: Spring: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: To give the students understanding of the concept of software architecture and how this phase in the development between requirement specification and detailed design plays a central role for the success of a software system. The students will get knowledge of some well-known architectures and be able to construct and evaluate architectures for software systems. In addition, the students should get some understanding of how the developers experiences and the technical and organisational environment will influence on the choice of architecture.
Recommended previous knowledge: TDT4100 Object-Oriented Programming, or equivalent. TDT4140 Software Engineering, or equivalent.
Academic content: Architectural styles and patterns, methods for constructing and evaluating architectures, and component-based development. Design patterns and object-oriented frameworks.

Teaching methods and activities: Lectures and exercises. The course will be held in English. Portfolio evaluation is the basis for the grade in the course. The portfolio includes a final written test (70%) and exercises (30%). The results for the parts are given in %-scores, while the entire portfolio is assigned a letter grade. If there is a repitition of an examination, the final exam can be changed to oral.
Course materials: To be announced at the start of the term.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	70/100	C
EXCERCISES		30/100	

TDT4245 Cooperation Technology

Lecturer: Professor Monica Divitini
Weekly hours: Autumn: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The course aims at giving students a basic knowledge of computer supported cooperative work (CSCW). This knowledge should allow students to compare and choose different solutions for supporting cooperative work as well as design new technologies.
Recommended previous knowledge: TDT4140 Software Engineering, or contact the teacher.
Academic content: Computer supported cooperative Work (CSCW), coordination, shared workspaces, cooperation support for nomadic users, design and evaluation of cooperative technologies.
Teaching methods and activities: Lectures and exercises. The course will be taught in English if there are students that do not speak Norwegian. For the continuation exam, the written exam can be substituted with an oral exam.
Course materials: Compendium available at course start.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TDT4250 Model-Driven Development of Information Systems

Lecturer: Professor John Krogstie, Førsteamanuensis Hallvard Trætteberg
Coordinator: Professor John Krogstie
Weekly hours: Autumn: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The students shall have theoretical insights into different languages and techniques used in industry for making models as parts ofinformation systems, as well as practical skills in making good models using techniques for model-driven development.
Recommended previous knowledge: Course TDT4175 Information Systems, or equivalent.
Academic content: The role of modelling in information systems development, focussing on techniques applied in industry where models are part of the implemented information systems, rather than as am intermediary representation. Different Model-based approaches is treated, such as model-driven ERP systems, workflow-systems, service-oriented architecture (SOA), Model-driven architecture (MDA), use of domain-specific modeling languages (DSL), examplified by Microsoft Software Factory and interactive models. Quality evaluations of models and modelling languages within theses areas.
Teaching methods and activities: Lectures and exercises. The course may be taught in English if taken by students without Norwegian language skills. Portfolio assessment is the basis for the grade in the course. The portfolio includes a final written test (70%) and exercises (30%). The results for the parts are given in %-scores, while the entire portfolio is assigned a letter grade. In case of delayed exam (continuation exam) the final written test may be replaced by an oral test.
Course materials: To be announced at the start of the term.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	70/100	C
EXCERCISES		30/100	

TDT4280 Distributed Artificial Intelligence and Intelligent Agents

Lecturer: Førsteamanuensis Pinar Øzturk
Weekly hours: Spring: 2F+3Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: To be able to describe the main principles of distributed AI and the use of techniques from AI in distributed environments. To define the notion of intelligent agenter (IA) and to explain the main characteristics of IAs. To

classify different types of IA architectures and their 'components' (i.e., reactive, deliberative, social components), and the relations between these components. To describe the propoerties of different types of agent environments and to be able to decide what kind of agent architecture is most suitable in each type of environment. To analyse and discuss differences and similarities, and advantages and disadvantages of different types of agents. To explain different types of interactions in multiagents systems. To be able to use different types of interaction strategies. To be able to analyse and determine which type of interaction is needed in a given multiagent environment. To describe the structure of an agent language, and to compare existing languages. Be able to use the agent languages in various agentinteraction settings.
Recommended previous knowledge: TDT4136 Logic and Reasoning Systems or IT2702 Artificial Intelligene (see catalogue 2006/07), or equivalent.
Academic content: The course gives an overview of the main aspects of distributed artificial intelligence, as for instance knowledge sharing, models of communication and cooperation in multi-agent systems, architecture for multi-agent systems. Central to the course is the term "intelligent agents" - its features and various possible architectures. A practical part of the course is assignments/projects involving implementation of various aspecs of multi-agent systems.
Teaching methods and activities: Lectures and exercises. Assignments are mandarory. The course will be held in English. Postponed/repeated exams may be oral.
Course materials: Textbook: Wooldridge, M.J.: An Introduction to Multiagent Systems. A set of papers: Will be announced at the start of the course.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TDT4287 Algorithms for Bioinformatics

Lecturer: Førsteamanuensis Magnus Lie Hetland
Weekly hours: Autumn: 2F+3Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The student should be able to use, and to some extent modify, known methods in order to solve bioinformatic problems. Some emphasis will also be put on individual and creative use of general algorithmic methods.
Recommended previous knowledge: The course TDT4120 Algorithms and Datastructures.
Academic content: The course deals with algorithmic methods with applications in bioinformatics, with a particular focus on string processing.
Teaching methods and activities: Lectures and exercises. If few students take the course, the lectures may be replaced with study groups. Postponed/repeated exams may be oral.
Course materials: Dan Gusfield, "Algorithms on Strings, Trees, and Sequences : Computer Science and Computational Biology" (Cambridge University Press, 1997). (This may change.)
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TDT4290 Customer Driven Project

Lecturer: Professor Reidar Conradi, Professor Jon Atle Gulla
Coordinator: Professor Jon Atle Gulla
Weekly hours: Autumn: 2Ø+22S = 15.0 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: To give the students practical experience in executing all phases of large IS/IT projects.
Recommended previous knowledge: Accepted to the 4th year of the computer science program.
Academic content: Each group is given a task from a client that is to be carried out as a project. All phases of IS/IT projects are to be covered: Preliminary studies, requirements specification, design, implementation, and evaluation. The emphasis is on the early phases. It is important that the groups work in close collaboration with the client. The groups will hand in a project report and give a final presentation and demonstration of a runnable system to the client and the censor. The following days are obligatory: the starting day of the course which is on Tuesday in the semester's second week, the two days course in group dynamics given early in the semester, and the weekly supervision. A failure to meet on these days may prevent the student from completing the course.
Teaching methods and activities: The tasks are carried out as group work with groups of 5-7 persons. Each group has a client and internal supervisors. The groups have obligatory meetings with the supervisors every week. The course includes a series of lectures.
Course materials: Reports from previous years and lectures.
Assessment: Work

Forms of assessment	Date/Time	Percentage	Exam. support
EXCERCISES		100/100	

TDT4520 Program and Information Systems, Specialization Project

Lecturer: Professor Eric Monteiro
Weekly hours: Autumn: 24S = 15.0 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The student will learn how to go into a specific problem using scientific methods, including aquiring complementary knowledge from litterature and other sources, and combining this with her/his own a priori knowledge. Furthermore, the student will learn how to complete a larger, independent project, including writing a project plan with milestones, reporting partial results and writing a final report according to professional and scientific standards.
Recommended previous knowledge: Theoretical background on master/graduate level within the focus area of the course. This course is only available to students admittet to relevant master programmes in technology. It is also available to international students with satisfactory background.
Academic content: Project work, with primary aim to be a foundation for the master thesis the following semester. The project will focus on issues in computer architecture or design, algorithm construction, high performance computing, graphics or visualisation.
Teaching methods and activities: Independent work under guidance of supervisor.
Course materials: Announced at semester start.
Assessment: Work

Forms of assessment	Date/Time	Percentage	Exam. support
EXCERCISES		100/100	

TDT4525 Program and Information Systems, Specialization Course

Lecturer: Professor Eric Monteiro
Weekly hours: Autumn: 2F+10S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The course will provide in-depth knowledge about issues relevant to computer architecture and design, algorithm construction, high performance computing, graphics and visualisation.
Recommended previous knowledge: Theoretical background on master/graduate level within the focus area of the course. This course is only available to students admittet to relevant master programmes in technology. It is also available to international students with satisfactory background.
Academic content: The student will choose two topics of 3.75 credits each, from the following list:
TDT09 E-commerce
TDT10 Software Technology: COTS and Open source software
TDT12 Advanced methods in user interface design
TDT25 Software quality and empirical work
TDT26 Business architectures
TDT29 Ubiquous cooperation technology
TDT37 Organisations and ICT
TDT38 Procedures in health services
TDT39 Empirical studies in IT
TDT40 Designing GUIs
TDT44 Semantic Web
TDT48 Developing mobile applications
TDT49 Mobile information systems
TDT60 Information security in IT-systems
TDT63 Advanced topics in information systems
TDT65 Outsourcing
TDT68 Analysing safety in IT-systems
TDT69 Artistic software: Processes and products
TDT71 Game development
TDT74 Research methods in informatics
Teaching methods and activities: Lectures, exercises, seminars and independent studies. In case of continuation exams, these will be arranged before the end of the same exam period.
Course materials: Announced at semester start.
Assessment: Oral examination

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	100/100	D

TDT4530 Bio-Informatics, Specialization Project

Lecturer: Professor Pauline Haddow
Weekly hours: Autumn: 24S = 15.0 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The student will learn how to go into a specific problem using scientific methods, including aquiring complementary knowledge from litterature and other sources, and combining this with her/his own a priori knowledge. Furthermore, the student will learn how to complete a larger, independent project, including writing a project plan with milestones, reporting partial results and writing a final report according to professional and scientific standards.
Recommended previous knowledge: Theoretical background on master/graduate level within the focus area of the course. This course is only available to students admittet to relevant master programmes in technology. It is also available to international students with satisfactory background.
Academic content: Project work, with primary aim to be a foundation for the master thesis the following semester. The project will focus on issues in computer architecture or design, algorithm construction, high performance computing, graphics or visualisation.
Teaching methods and activities: Independent work under guidance of supervisor.
Course materials: Announced at semester start.
Assessment: Work

Forms of assessment	Date/Time	Percentage	Exam. support
EXCERCISES		100/100	

TDT4535 Bio-Informatics, Specialization Course

Lecturer: Professor Pauline Haddow
Weekly hours: Autumn: 2F+10S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The course will provide in-depth knowledge about issues relevant to computer architecture and design, algorithm construction, high performance computing, graphics and visualisation.
Recommended previous knowledge: Theoretical background on master/graduate level within the focus area of the course. This course is only available to students admittet to relevant master programmes in technology. It is also available to international students with satisfactory background.
Academic content: The student will, with supervisor's conscent, choose two topics of 3.75 credits each.
TDT04 Biological inspiration - fault tolerance and adaptivity
TDT11 Evolutionary hardware
TDT21 Pattern recognition using evolutionary methods
TDT24 Parallel environments and numerical metods
TDT34 Quantitative modelling techniques
TDT44 Semantic Web
TDT45 Managing very large data volumes
TDT46 Information retrieval
TDT55 Knowledge intensive CBR
TDT74 Research methods in computer science
Teaching methods and activities: Lectures, exercises, seminars and independent studies. In case of continuation exams, these will be arranged before the end of the same exam period.
Course materials: Announced at semester start.
Assessment: Oral examination

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	100/100	D

TDT4540 Healthcare Informatics, Specialization Project

Lecturer: Førsteamanuensis Øystein Nytrø
Weekly hours: Autumn: 24S = 15.0 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The student will learn how to go into a specific problem using scientific methods, including aquiring complementary knowledge from litterature and other sources, and combining this with her/his own a priori knowledge. Furthermore, the student will learn how to complete a larger, independent project, including writing a project plan with milestones, reporting partial results and writing a final report according to professional and scientific standards.

Recommended previous knowledge: Theoretical background on master/graduate level within the focus area of the course. This course is only available to students admittet to relevant master programmes in technology. It is also available to international students with satisfactory background.
Academic content: Project work, with primary aim to be a foundation for the master thesis the following semester. The project will focus on issues in computer architecture or design, algorithm construction, high performance computing, graphics or visualisation.
Teaching methods and activities: Independent work under guidance of supervisor.
Course materials: Announced at semester start.
Assessment: Work

Forms of assessment	Date/Time	Percentage	Exam. support
EXCERCISES		100/100	

TDT4545 Healtcare Informatics, Specialization Course

Lecturer: Førsteamanuensis Øystein Nytrø
Weekly hours: Autumn: 2F+10S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The course will provide in-depth knowledge about issues relevant to computer architecture and design, algorithm construction, high performance computing, graphics and visualisation.
Recommended previous knowledge: Theoretical background on master/graduate level within the focus area of the course. This course is only available to students admittet to relevant master programmes in technology. It is also available to international students with satisfactory background.
Academic content: The student will, with supervisor's conscent, choose two topics of 3.75 credits each.
TDT25 Software quality and empirical work
TDT26 Business architectures
TDT29 Ubiquous cooperation technology
TDT30 Data mining
TDT37 Organization and ICT
TDT38 Procedures i health services
TDT40 GUI design
TDT43 IT Infrastructure Libraries
TDT44 Semantic Web
TDT46 Information retrieval
TDT48 Developing mobile applications
TDT49 Mobile information systems
TDT60 Information security in data systems
TDT63 Topics in information systems
TDT64 XML technology and standards
TDT74 Research methods in information technology
Teaching methods and activities: Lectures, exercises, seminars and independent studies. In case of continuation exams, these will be arranged before the end of the same exam period.
Course materials: Announced at semester start.
Assessment: Oral examination

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	100/100	D

DT8112 Research Topics in Health Informatics

Lecturer: Førsteamanuensis Øystein Nytrø
Weekly hours: Spring: 2F+2Ø+8S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Pass/Fail Compulsory assignments: None

Recommended previous knowledge: Healthcare informatics, or informatics with practical healthcare experience.
Academic content: The subject is held biannually, next time spring 2008, or as needed.
The course focusses on the challenge of the duality between basic computer science and applied (healthcare) informatics research. Core problem areas selected by the students are analysed from different prespectives, and each student makes complementary article-sketches, both within application and basic theory. The core problems may be chosen from recent computer science research applied to clinical healthcare information systems, eg: Knowledge representation, development methods, inforamtion security, architecture, user interfaces, information analysis, data mining, machine learning, decision- and cooperation support.
Teaching methods and activities: Seminar.
Course materials: Research reports. Conference- and journal papers.

Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
PORTFOLIO ASSESSMENT		1/1	

IT2801 Information Retrieval

Lecturer: Førsteamanuensis Herindrasana Ramampiaro
Weekly hours: Spring: 2F+2Ø+8S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises
Learning objectives: The students will learn and understand the principle, techniques and methods behind information retrieval.
Recommended previous knowledge: IT1104 Programming Advanced Course and IT1607 Introduction to Databases
Academic content: The course concerns automatic document storage and retrieval. In this case, the term document includes sounds and images as well as text. With this course you will learn about file organising, query operations, document operations and knowledge-based textual and multimedia information retrieval.
Teaching methods and activities: Lectures and exercises.
For postponed exams, written exams can be changed to oral exams.
Course materials: To be announced at the start of the semester
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web		D

IT3604 Organization and ICT

Lecturer: Professor Eric Monteiro
Weekly hours: Autumn: 2F+2Ø+8S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The aim is to provide insight into the organisational aspects in and around systems design
Recommended previous knowledge: IT 2603 or similarly
Academic content: Organisational issues in and around systems design. The key challenge amounts to understand and improve the interaction of technological and social aspects around development and use. Both theoretical and empirical experiénces are covered. More specifically, perspectives on systems design, user participation, automation of work, cooperation and coordination.
Teaching methods and activities: Lectures, colloquium, self study and exercises
Course materials: Announced at beginning of term
Assessment: Assignment

Forms of assessment	Date/Time	Percentage	Exam. support
ASSIGNMENT		1/1	

IT3706 Knowledge Representation and Modelling

Lecturer: Førsteamanuensis Pinar Øzturk
Weekly hours: Autumn: 2F+4Ø+6S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: To describe the notions of 'knowledge' and 'representation, and the explain the relationship between these. To describe the main requirements form a reresentation language. To analyse different types of representation paradigms, to explain advantages and disadvantages of each type, to choose the right type of language in a given problem. To discuss why representation is usefull and necessary, and
to discuss why a group of researches argues that representation is not needed. To be able to model the knowledge in a given domain, and decide which knowledge acquisition type is the best one in e given problem setting.
Recommended previous knowledge: TDT4136 Logic and Reasoning Systems or IT2702 Artificial Intelligence, or equivalent
Academic content: Main characteristics of a knowledge representation language will be studied. Various KR paradigms will be compared with respect to these characteristics. The representation languages will be related to the underlying inference methohds, and syntactical, semantical, and pragmatical aspects of computational representations. Advantages and disadvantages of each paradigm will be analysed. Methods for knowlege analysis and modelling will be investigated. An introduction to ontology notion will be given.
Teaching methods and activities: Lectures, guided colloquia, self study, and exercises. Portfolio evaluation is the basis for the grade in the course. The portfolio includes a final oral exam (80%) and semesteroppgave (20%). The results for the parts are given in %-scores, while the entire portfolio is assigned a letter grade. There will be a set og assignments that must be approved in order to take the exam.
Course materials: Textbook and a set of papers.

Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	8/10	
TERM PAPER		2/10	

Department of Energy and Process Engineering

TEP4155 Viscous Flow and Turbulence

Lecturer: Professor Helge Ingolf Andersson
Coordinator: Professor Tor Ytrehus
Weekly hours: Spring: 4F+1Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: This subject aims at building competence in formulating and solving fluid mechanics problems where viscosity and turbulence are of importance.
Recommended previous knowledge: Prerequisites: Basic fluid mechanics, for instance course TEP4105, or equivalents.
Academic content: Contents: Derivation and discussion of the basic equations in viscous fluid mechanics. Molecular background for viscosity and heat conductivity. Couette flow with heat conductivity and compressibility, Stokes 1. problem, Hiemenz problem for stagnation flow. The boundary layer approximation. Similarity solutions; Blasius and Falkner-Skan solutions, free shear layers and jets. Qualitative description of turbulence. Mean field description; Reynolds decomposition, Reynolds equations and mechanical energy. Turbulence modelling, eguilibrium models. Two-point closure. Turbulent boundary layers and shear layers.
Teaching methods and activities: Lectures and written exercizes. The lectures and exercises may be in English when students who do not speak Norwegian take the course. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: Course material: F.M.White: Viscous Fluid Flow, 2. edition, and specail notes.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TEP4220 Energy and Environmental Consequences

Lecturer: Professor Gernot Krammer, Førsteamanuensis Anders Hammer Strømman
Coordinator: Professor Edgar Hertwich
Weekly hours: Spring: 4F+1Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: This course aims to provide students with an understanding of the environmental consequences of energy systems, of quantitative impact assessment methods, and skills for building simple models for the purpose of environmental impact assessment.
Recommended previous knowledge: At least 30 studypoints (1 semester) of math, physics, chemistry or other quantitative courses.
Academic content: The course provides a introduction to methods for the assessment of environmental effects of technical systems and products: risk analysis, life-cycle assessment and external costs. The focus is on emissions from energy systems and technologies used in the energy sector. The course discusses the use, assumptions, strengths and limitations of these methods. The course includes combustion as the most important emissions source, the distribution of emissions through various transport processes in air, water and soil, exposure and damage. The course addresses global warming, the human health and ecological effects of toxic emissions, acidification and eutrophication. Through these methods will the students be able to understand the relation between technology and environmental problems in order to identify option for more sustainable technical systems.
Teaching methods and activities: The lectures focus on knowledge of different types of environmental probelms and of methods to assess environmental impacts. Exercises aim at enabling the student to set up simple models to describe different processes ocurring in nature. The models consist of sets of equations and are solved on paper or with the use of Excel or Matlab. There is a requirement for a minimum number of problem sets to be handed. The course is thaught in English. A missed exam (continuation exam) can be given as an oral exam.
Course materials: Course reader.
Assessment: Written examination/Midterm

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	70/100	C
MIDTERM EXAMINATION		30/100	C

TEP4222 Input-Output Analysis, Trade and Environment

Lecturer: Professor Edgar Hertwich
Coordinator: Førsteamanuensis Anders Hammer Strømman
Weekly hours: Autumn: 2F+2Ø+8S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: An understanding of production systems and international value chains is increasingly important for industry and policy makers alike. This course covers national economic and environmental accounts, economic input-output analysis, the economic modeling of production technologies and the development of scenarios using dynamic input-output models, as well as trade. The course includes an introduction to Matlab.
Recommended previous knowledge: Linear algebra. A basic understanding of economics. An introductory course in environmental science or environmental economics.
One of the following courses or equivalent: TEP4223 Life-cycle Assessment and Eco-Efficiency, TIØ4120 Operations reasearch.
Contact main lecturer for inquiries regarding prerequisites.
Academic content: Input-output modeling is increasingly important in environmental analysis. The course addresses the use of input-output models in national energy policy modeling, in product life-cycle assessment, and in material flow analysis. Three cutting-edge applications are the determination of household environmental profiles for sustainable consumption, the combination of monetary input-output data and physical process models in hybrid life-cycle assessment, and the development of a generalized trade model (multi-regional input-output model) based on comparative advantage. Comparative advantage is determined by relative factor prices and by the technology and structure of national industries. The course addresses the use of existing economic and environmental data and the application of different modeling techniques in industry, public policy and for consumer information.
Teaching methods and activities: The course consists of lectures and problem sets. The course reading is mandatory. The lectures are in English. For coninuation exam, the exam may be changed to an oral exam.
Course materials: To be determined later.
Assessment: Written examination/Work

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	70/100	C
EXCERCISES		30/100	

TEP4223 LCA and Eco-Efficiency

Lecturer: Professor Edgar Hertwich, Førsteamanuensis Anders Hammer Strømman
Coordinator: Førsteamanuensis Anders Hammer Strømman
Weekly hours: Autumn: 4F+1Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The course provides an introduction to LCA of products and energy systems for students in the Industrial Ecology program and other students who take this course as an elective. The aim of the course is to provide an in-depth knowledge of different methods used in LCA and their application, also for the evaluation of the eco-efficiency of companies and value chains. The aim is to enable students to do an LCA with the help of LCA software.
Recommended previous knowledge: Basic university maths. The number of students is limited to 50. Students from the Industrial Ecology program are guaranteed a space.
Academic content: Life-cycel assessment (LCA) is a tool to evaluate the environmental consequences of products and systems. LCA is used in eco-design, to evaluate energy systems, and to develop regulations for recycling. The course has following elements: aim and history; mathematical structure of LCA; process flow diagrams and analysis; use of input-output methods in LCA; evaluation of different types of environmental problems; weighting; and interpretation. The use of LCA in energy systems and corporate environmental accounting is covered. Students will write a project report based on a case study that is developed in cooperation with a Norwegian company.
Teaching methods and activities: The lectures are in English. The lectures cover the theory, while the project gives students practical experience. In case of a midded written exam (continuation exam) can the exam be changed to oral exam.
Course materials: To be announced.
Assessment: Written examination/Work

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	70/100	C
EXCERCISES		30/100	

TEP4240 System Simulation

Lecturer: Førsteamanuensis Kjell Kolsaker
Coordinator: Førsteamanuensis Reidar Kristoffersen
Weekly hours: Autumn: 4F+1Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises, Project (in group)

Learning objectives: The student will learn to perform mathematical modelling, analysis and optimization of various technical systems. The course will, through modelling and simulation practising and intensive Matlab use, bridge the gap between basic and special courses, making the student a secure performer of numerical modelling and analyses.
Recommended previous knowledge: TEP4115/TEP4120 Thermodynamic 1, TEP4100 Fluid Mechnics or similar subjects.
Academic content: Similarities between different energy domains; studying and training in a graph oriented systematic system modelling and simulation; numerical solution of mathematical equations, especially a set of ordinary differential equations (ODEs); Matlab® as a tool for mathematical formulation, simulation and solution presentation; examples and problems from mechanical, hydraulic, thermal and thermodynamic systems; energy system design and analyses; source and response analyses; introduction to optimization; introduction to a few advanced software packages for field calculation and system simulation.
Teaching methods and activities: Lectures, problem solving, learning and training in use of Matlab®, two project works. The students will work in 3-4 person groups solving problems and performing plenary presentations together reporting progress and findings. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: A compendium will be made available through It's:learning-portal.
Assessment: Written examination/Work

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	70/100	D
EXCERCISES		30/100	

TEP5100 Industrial Ecology, Project

Lecturer: Professor Edgar Hertwich, Førsteamanuensis Anders Hammer Strømman
Coordinator: Professor Edgar Hertwich
Weekly hours: Autumn: 24S = 15.0 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The project gives students knowledge and skills to address scientific problems and to report results. Learning includes the application of industrial ecology methods towards practical, interdisciplinary problem solving or in scientific work.
Recommended previous knowledge: A precondition is that the student has taken courses which provide a sufficient qualification for the project work.
Academic content: This subject addresses the systems analysis of environmental issues from a technical, economic and industrial perspective. It makes use of life-cycle assessment, input-output analysis, systems engineering, material flow analysis, cost-benefit analysis, risk analysis or related techniques. It addresess technical systems, products, households or organisations.
Teaching methods and activities: Supervised independent project.
Course materials: Information at start of semester.
Assessment: Work

Forms of assessment	Date/Time	Percentage	Exam. support
EXCERCISES		100/100	

Department of Electrical Power Engineering

TET4115 Power System Analysis

Lecturer: Professor Olav B Fosso, Professor Arne Torstein Holen
Coordinator: Professor Arne Torstein Holen
Weekly hours: Autumn: 4F+4Ø+4S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises, Project work, Laboratory work with report

Learning objectives: The main objective of the course is to learn about power system behaviour under symmetrical and unsymmetrical faults, including basic principles for protection against such faults. Additionally, the students will learn basic principles for formulation and application of optimal power flow.
Recommended previous knowledge: TFE4100 Electric Circuits, TET4100 Circuit Analysis and TET4155 Energy Systems or similar.
Academic content: Power system analysis focusing on symmetrical and unsymmetrical faults. Symmetrical components. Building power system description based on node impedance matrix. Component modeling (transformers, lines and cables)for

positive-, negative- and zero sequence. Alternative earthing systems. Basic principles for power system protection. Optimal power flow, formulation and application.
Teaching methods and activities: Lectures, mandatory written assignments, laboratory work and a project work using computer programs. Portfolio evaluation is the basis for the final grade in the subject. Parts of the portfolio are final exam (75%) and project work (25%). The final grade is given on standard form as a letter code. The course is given in English. Postponed/ repeated exams may be oral.
Course materials: Lecture notes (in English).
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	75/100	D
EXCERCISES		25/100	

TET4120 Electrical Motor Drives

Lecturer: Professor Lars Einar Norum
Weekly hours: Spring: 4F+4Ø+4S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises, Laboratory work with report

Learning objectives: The course is aiming to give an introduction to converter topologies and control principles used in modern electrical motor drives.
Recommended previous knowledge: TET4110 Electrical Machines or similar knowledge.
Academic content: This course covers the most commonly used type of electrical motor drives. Part I gives an overview of different type of electrical motor drive, type of load functions including the impact of using mechanical gears/transmissions. In part II some simplified models of the most commonly used power electronic converter topologies are presented. Control- and modulation methods are included as well. Part III in the course is devoted to DC drives. Mathematical modelling is performed, analysis of steady state characteristics and as well as dimensioning of current- and speed controllers. In part IV a general model of AC machines are presented. This includes introduction of space vectors, transformations and transformed mathematical models. In part V Permanent magnet synchronous is presented. Induction Motor Drives are discussed in part VI. In particular, the control principle- Rotor Flux Oriented Control - is covered in details.
Teaching methods and activities: Lessons and exercises. The students will be divided into project groups to perform the projects. The exercises will cover dimensioning, analysis and simulation of specific drive applications. Two laboratory exercises are mandatory. The course is given in English. Postponed/repeated exams may be oral.
Course materials: Lecture notes, manuals for simulation program.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TET4135 Planning and Operation of Energy Systems

Lecturer: Professor Terje Gjengedal, Førsteamanuensis Rolf Ulseth
Coordinator: Professor Gerard Lodewijk Doorman
Weekly hours: Spring: 3F+4Ø+5S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises, Project work

Learning objectives: The course aims to give an introduction to the formulation and solution of central problems within technical-economic-environmental planning and operation of stationary energy supply systems, both electrical and thermal. Based on a set of given technical possibilities, the course gives a methodical basis for optimization of solutions, and investigation of technical, economical and environmental consequences when meeting the demand for electrical and thermal energy.
Recommended previous knowledge: TET4155 Energy Systems or equivalent.
Academic content: Framework conditions such as legislation, international obligations etc. Description of demand and supply of energy in Norway. Technical-economic-environmental description of different processes for transport, conversion and consumption of energy. Energy and heat planning. Local energy planning. Optimization of energy systems, i.e. optimal operation and expansion planning of such systems. Planning under uncertainty.
Teaching methods and activities: Lectures and compulsory written assignments. Compulsory project work. The final evaluation will be based on a written examination (counting 75%) and the project work (counting 25%)based on % fulfillment. Final grading will be from A to F. If there is a re-sit examination, the examination form may change from written to oral.
Course materials: Printed compendium (Faanes, Ulseth).
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	75/100	D
EXCERCISES		25/100	

TET4160 Insulating Materials for High Voltage Applications

Lecturer: Professor Erling Ildstad
Weekly hours: Autumn: 3F+5Ø+4S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises, Laboratory work with report

Learning objectives: The course aims to give an introduction to properties of different insulating materials used for design of High Voltage apparatus.
Recommended previous knowledge: Basic Electric Field calculation, Physics and chemistry.
Academic content: Properties of different insulation systems based on: gas, solids and liquid/paper. Mechanisms of electrical conduction, polarisation, dielectric loss and breakdown. Ageing mechanisms (partial discharges, thermal degradation,water treeing, etc.) and methods for condition assessment including environmental aspects.
Teaching methods and activities: Lectures, audithorium- and laboratory exercises. The laboratory exercises cover the topics: - Measurement of dielectric loss and detection of partial discharges in airgaps. Electric breakdown strength of airgaps exposed to AC, DC and impulse high voltage. The course is given in English. Postponed/repeated exams may be oral.
Course materials: Compendium.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TET4165 Light and Lighting

Lecturer: Førsteamanuensis Eilif Hugo Hansen, Professor Barbara Matusiak
Coordinator: Førsteamanuensis Eilif Hugo Hansen
Weekly hours: Autumn: 4F+2Ø+6S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises, Laboratory work with report

Learning objectives: The course will give an introduction to the physical and physiological basis for light and lighting, to photometric notions and laws, and to the basis for planning of lighting systems and practical uses og light indoors and outdoors.
Recommended previous knowledge: Basic mathematics and physics.
Academic content: Radiometric notions and units, the human eye and radiation, photometric notions and units, the photometric laws, the eye and factors for sight, energy converting to light, colour, luminaires, quality criteria, lighting calculations, lighting systems, road and tunnel lighting. Daylighting : Source, calculation, effects.
Teaching methods and activities: Lectures, theory and laboratory exercises. If there is a re-sit examination, the examination form may change from written to oral.
Course materials: Hans-Henrik Bjørset, Eilif H. Hansen: Lysteknikk (last edition). In Norwegian. Lyskultur publication 21 : Dagslys i bygninger. In Norwegian.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TET4170 Electrical Installations

Lecturer: Førsteamanuensis Eilif Hugo Hansen
Weekly hours: Spring: 3F+3Ø+6S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises, Project work, Laboratory work with report

Learning objectives: The course will give the students good skills in planning and dimensioning of low voltage installations for industry, residential and non-residential buildings.
Recommended previous knowledge: Basic electrial engineering.
Academic content: Planning of electrical installations: Analysis of needs, calculation of power demands for heating and lighting. Structures for electical systems, topology and topography. Low voltage distribution systems (IT,TT,TN). Distribution and dimensioning of circuits. Safety precautions for electrical installations. Equipment and methods for protection: Overcurrent protection, earth fault protection, overvoltage protection. Discrimination. Earthing systems. Installation and equipment. Installation bus systems. Emergency and backup power supply. Software tools.
Teaching methods and activities: Lectures, theory and laboratory exercises.
Project work in groups. Postponed/repeated exams may be oral.
Course materials: Eilif H. Hansen: Elektroinstallasjoner (In Norwegian). Forskrifter for elektriske lavspenningsanlegg (FEL) (Norwegian regulations, in Norwegian). NEK400: Elektriske lavspenningsinstallasjoner (Norwegian standard).
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	70/100	C
EXCERCISES		30/100	

TET4180 Electric Power System Stability

Lecturer: Professor Olav B Fosso
Weekly hours: Spring: 3F+6Ø+3S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises, Project work

Learning objectives: The course aims to give basic knowledge about the dynamic mechanisms behind angle stability problems in electric power systems, including physical phenomena, modelling issues and simulations.
Recommended previous knowledge: TTK4105 Control Systems, TET4110 Electrical Machines, TET4115 Power Systems Analysis.
Academic content: 1. Steady state and transient system analysis using simplified models for the synchronous machine. 2. Power-frequency control and voltage control using a more detailed model of the synchronous machine, also including penstock and hydro turbine. Power system damping and application of FACTS components. Secondary control: active reserves and load following control. Teaching in class, exercises and project work. A group project work running through most of the semester is a major part of the home work. MATLAB and SIMPOW are used as tools for modelling and simulation of various aspects of power system stability phenomena. The project is being graded and is given 25% weight at the final exam.
Teaching methods and activities: Lectures, exercises, computer simulations and project. The final evaluation will be based on a written examination (counting 75%) and a project (counting 25%) based on % fulfillment. Final grading will be from A to F. The course is given in English. Postponed/repeated exams may be oral.
Course materials: Book: Power System Dynamics and Stability, J Machowski; J Bialek, J Bumby, John Wiley Sons, ISBN 0 471 97174 X (PPC), 0 471 95643 0 (PR). Lecture notes. Written assignments and computer programs.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	75/100	D
EXCERCISES		25/100	

TET4185 Power Markets, Resources and Environment

Lecturer: Professor Ivar Wangensteen
Weekly hours: Spring: 3F+4Ø+5S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The main topic is an introduction to the deregulated power market, how generation planinng is done and how grid companies and the System Operatos attend to their responsibilities.
Recommended previous knowledge: Course TET4155 Energy Systems or the equivalent.
Academic content: Description of power markets with emphasise on the Norwegian/Nordic solution. System operation, tariffs and congestion management. Optimal power flow. Different models for energy and power market analysis. Risk management. Generation planning and trade in an open market. Consideration for recourses and the environment.
Teaching methods and activities: Lectures, written assignements, project, excursion(s). The course is given in English. Postponed/repeated exams may be oral.
Course materials: From 2007 new textbook: "Power System Economcs. The Noric electricity market", Tapir. PowerPoint presentations.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TET4190 Power Electronics for Renewable Energy

Lecturer: Professor Tore Marvin Undeland
Weekly hours: Autumn: 4F+4Ø+4S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises, Project work, Laboratory work with report

Learning objectives: The course aims to give the students basic knowledge of the design and manner of operation of power electronic converters. It shall give the students a broad understanding of the vital role of power electronics in introducing renewable energy, in the power system and how it may enhance energy saving. Through problemsolving, laboratory exercises and projects the students shall develop a physical undertanding of the theory presented in the course.
Recommended previous knowledge: All students from Energy and Environmental Engineering and Electric Power Engineering are eligible.
Academic content: Sustainable energy technologies as wind energy, solar power, wave energy,
fuel cells and hydrogen and gas are described. The use of power electronics is described in detail. Convertion, control and monitoring of electric energy with the use of semiconductors. Methods for analyzing converters including resonance converters for design. Selection of converter topologies, power semiconductors and passive elements. Design of heat sinks and magnetic

components. Industrial applications like SMPSs, UPSs and induction heating. Power electronics in the power system is described, like HVDC, FACTS and static reactive compensation.
Teaching methods and activities: Lectures and exercises, all in English. Compulsory laboratory experiments. Project work that will be presented in a seminar in November 2006. The final evaluation will be based on a written examination (counting 50%), two mid-term examinations(counting 40% based on % fulfillment) and the project with a presentation (counting 10 %). Final grading will be from A to F. Postponed/repeated exams may be oral.
Course materials: Mohan, Undeland, Robbins: Power Electronics: Converters, Applications and Design. 3rd Edition. John Wiley og Sons, 2003. Lecture notes.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	50/100	D
MIDTERM EXAMINATION		20/100	D
MIDTERM EXAMINATION		20/100	D
EXCERCISES		10/100	

TET4195 High Voltage Equipment

Lecturer: Professor Erling Ildstad, Professor Arne Nysveen, Professor II Magne Eystein Runde
Coordinator: Professor II Magne Eystein Runde
Weekly hours: Spring: 4F+4Ø+4S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The aim is to give knowledge on working priciples, design and operation of switching equipment, underground power cables and power transformers.
Recommended previous knowledge: TET4160 Insulating Materials for High Voltage Applications.
Academic content: The course gives a comprehensive introduction to the technologies that are employed in switching equipment, underground power cables and power transformers. The switching equipment sections cover switching over-voltages, the electric arc, arcing media (SF6, vacuum, air, oil), breaker designs, fuses, as well as gas insulated and air insulated substations. The cable part describes various designs and technologies used for underground cables, power rating evaluations, corrosion, and cable termination and splicing. The transformer section covers the electric insulation system, stresses during transient over-voltages, thermal aspects, protection, winding connections, and standards for transformer testing.
Teaching methods and activities: Lectures and tutorials. Excursion to Norwegian manufacturers of power cables, transformers and switchgear. The course is given in English. Postponed/repeated exams may be oral.
Course materials: Compendium.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TET4200 Maritime and Offshore Power Systems

Lecturer: Professor Arne Nysveen
Weekly hours: Spring: 4F+4Ø+4S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises, Project:Power system on an oil drilling platform

Learning objectives: The students will learn how to design, construct and analyze marine power systems, with focus on power systems on ships with electrical propulsion, floating vessels for oilgas production and subsea power systems.
Recommended previous knowledge: Electrical Machines. Electrical Power Systems.
Academic content: Application of electrical power on marine installations, i.e ships with electrical propulsion, vessels for production of oilgas and subsea oilgas process installations. Power distribution layout, system dimensioning, short circuit analysis, start-up of large motors, thermal and mechanical dimensioning, cable modelling. Topside and subsea large motor drives. Power generation. Subsea motors, subsea high voltage equipment. Electrical heating of subsea pipelines.
Teaching methods and activities: Lectures and compulsory exercises. Analysis of marine power systems with the simulation program SimPow. The course is given in English. Postponed examination may be changed from written to oral examination.
Course materials: Stated at start of the semester.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TET5100 Power Engineering Updates

Lecturer: Professor Arne Torstein Holen, Professor Arne Nysveen
Coordinator: Professor Arne Nysveen
Weekly hours: Autumn: 4F+4Ø+4S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises, Project in Power system analysis

Learning objectives: The aim of this course is to give students with a Bachelor in Power Engineering a deeper understanding of different subtopics in electromagnetics and circuit analysis needed for master studies in electrical power engineering.
Recommended previous knowledge: Students with a BSc in Electrical Power Engineering/Students with a three year college education in the field of electrical power engineering.
Academic content: Design of installations and equipment requires both a physical understanding and knowledge of mathematical modelling. Further there is a need to use analytical and numerical methodes to solve sets of equations. In this course several practical problems connected to installations and devices will be highlighted. The students use basic field- and circuit theory to determine parameters which characterise the installation or the different components. Adressed topics are: Circuit models for magnetic and electrical problems; analogies. Use of dielectric insulation material, field control, shielding. Conductor and contact problems. Magnetic fields, magnetic materials, dynamic magnetic coupled circuits, windings. Eddy currents - surface power density, proximity effects. Inductance, resistance and capacitance. Circuit models. Line/Cabel models. Forces and energy. Simple modeles for electrical machines. Description of electrical power systems based on node admittance and node impedance. Load flow analysis: Calculation of voltage balance and power flow in a power system.
Teaching methods and activities: Lectures and compulsory written assignements. Project in network analysis. The course is given in English. Postponed examination may be changed from written to oral examination.
Course materials: Arne T. Holen: "TET4115 Power System Analysis/TET5100 Power Engineering Update", Compendium, Tapir. Robert K. Nilssen: "Electromagnetics in Power Engineering", Compendium, Dept. of Electric Power Engineering, NTNU. Joseph A. Edminister: "Schaum's outlines: Electromagnetics", 2nd ed., McGraw-Hill.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	A

TET5500 Electric Power Engineering, Specialization Project

Lecturer: Førsteamanuensis Eilif Hugo Hansen
Weekly hours: Autumn: 24S = 15.0 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The student will specialize himself/herself within a specific topic within electric power engineering based on scientific methods. It shall give the students knowledge and skills in how to carry out individual research projects, including reporting of the achieved results.
Recommended previous knowledge: At the selection of a project work it is supposed that the student have a combination of courses that makes up a sufficient professional background to implement the project in a good manner.
Academic content: This course includes a specialization project at 15 ECTS credits directed towards electrical utilities and power systems, development and use of equipment for energy conversion, materials for use in electrical components, overvoltage problems, condition assessment and diagnostic methods. Additionally, it is focused on system analysis for generation, transmission, conversion and end use of energy, including technical, economical and environmental aspects. The projects may include offshore and marine plants, transmission and distribution networks, systems with mixed energy sources and carriers, installations in buildings, use of renewable energy resources, electrical railway systems and propulsion of vehicles. Also, relevant topics are energy markets and energy cooperation with foreign countries, power demand, power quality and reliability, integration of new energy sources in the electrical power system. With the choice of the project work every student will be connected to one of the following professional groups at The Department of Electric Power Engineering: Energy Conversion Group - Power System Group - Electrical Power Technology Group.
Teaching methods and activities: Independent project work with guidance.
Assessment: Work

Forms of assessment	Date/Time	Percentage	Exam. support
EXCERCISES		100/100	

TET5505 Electric Power Engineering, Specialization Course

Lecturer: Førsteamanuensis Eilif Hugo Hansen
Weekly hours: Autumn: 12S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises/Laboratory exercises

Learning objectives: The specialization course will give the students knowledge and skills in analyzing and solving energy related problems of scientific and technical nature. The course is supposed to be closely related to the chosen specialization project.
Recommended previous knowledge: Knowledge obtained through the compulsory and optional courses in electric power engineering given in the 1st year of the master program Electric Power Engineering or similar.
Academic content: The course consists of two themes at 3.75 ECTS credits each. Choice of themes is done in consultation with the supervisor of the chosen specialization project. The themes should be chosen from the following list (all 3.75 ECTS credits):
ELK-10 Power Quality and Interruption Costs.
ELK-11 Efficiency Improvements in Networks.
ELK-12 Wind Power in the Norwegian Energy System.
ELK-13 Electricity Trade and Risk Management.
ELK-14 Transmission System Operation Planning.
ELK-15 Hydro Power Scheduling.
ELK-20 Design of Power Electronic Converters.
ELK-21 Electronics for Control of Power.
ELK-22 Design of Electromagnetic Devices.
ELK-30 Condition Assessment of High Voltage Components.
ELK-31 Computer Simulation of Electrical Transients.
ELK-32 Intelligent Installations in Buildings.
ELK-40 Local/Regional Energy Planning (at UniK).
If the nature of the specialization project gives a scientific reason to choose one theme not mentioned on the list above, this may be accepted.
Teaching methods and activities: The teaching of the themes may be given as lectures, exercises, seminars or guided self-tuition. Postponed exam is held within the end of the exam period.
Course materials: Information is given at start of the term.
Assessment: Oral examination

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	100/100	D

Department of Physics

TFY4225 Nuclear and Radiation Physics

Lecturer: Professor Tore Lindmo
Weekly hours: Autumn: 4F+3Ø+5S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Calculation exercises, Laboratory exercises

Learning objectives: This course deepens the students' understanding of the constituents, properties and processes of atomic nuclei, as well as the properties, interaction processes and practical use of ionizing radiation from nuclear processes. Students will be able to find and use relevant data to assess and evaluate the occurrence and effects of nuclear processes and ionizing radiation.
Recommended previous knowledge: Course TFY4250 Atomic and Molecular Physics, or equivalent. Some background in quantum mechanics (TFY4205 Quantum Mechanics or equivalent) is useful.
Academic content: This course describes models for the constituents and properties of nuclei, nuclear processes and particle interactions with emphasis on alpha, beta and gamma radiative processes as examples of strong, weak and electromagnetic interactions. Description of various mechanisms for interaction between ionizing radiation and matter, and introduction to radiation dosimetry. The course includes applications such as detection of radiation, nuclear power generation, environmental exposure to ionizing radiation, risk assessment, and radiation protection.
Teaching methods and activities: Lectures, problem solving, mandatory laboratory assignments. Teaching will be in English if students on international master programs are attending the course. Mid-term exam weighs 20 % in total grade score. A re-sit examination may be changed from written to oral.
Course materials: J. Lilley: Nuclear Physics, John Wiley og Sons, 2001. Some supplementary material.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	80/100	C
MIDTERM EXAMINATION		20/100	C

TFY4265 Biophysical Micromethods

Lecturer: Professor Catharina de Lange Davies
Weekly hours: Autumn: 3F+3Ø+6S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The course aims at giving an introduction in principles and methods for investigations of biological macromolecules, cells and various soft materials, by the use of various microscopy techniques and spectroscopy.
Recommended previous knowledge: Background in Cell biology.
Academic content: Mechanisms for molecular excitation and de-excitation. Interactions between light and biological specimens. Light microscopy. Fluorescence microscopy. Confocal and multi-photon microscopy. Nonlinear optical imaging. CCD camera. Lasers. Flow cytometry. Optical tweezers and scissors. Intermolecular forces. Atomic force microscopy (AFM). Interactions between electron and biological specimens. Electron-optics. Transmission (TEM), scanning (SEM) and scanning transmission (STEM) electron microscopy. Electron diffraction. Preparation of biological specimens for microscopy. Bionanophotonics.
Teaching methods and activities: Lectures and laboratory excercises. Teaching will be in English if students students on international master programs are attending the course. A re-sit examination may be changed from written to oral.
Course materials: Compendium.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	80/100	D
EXCERCISES		20/100	

TFY4300 Energy and Environmental Physics

Lecturer: Forsker Sverre Vegard Pettersen
Coordinator: Førsteamanuensis Turid Worren
Weekly hours: Autumn: 4F+1Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Written exercises

Learning objectives: The students are going to be able to describe and explain the origins of global effects on the environment caused by human activities, the physical basis for the exploitation of various energy sources, and make assessments on different energy technologies (potential, pros and cons).
Recommended previous knowledge: General knowledge in physics.
Academic content: The energy budget of the earth, the green house effect, radiation, atmospheric changes due to human activities. Methods and the physical basis for exploitation of conventional (fossil fuels and nuclear energy) and renewable energy sources (solar radiation, wind, bio mass, ocean waves, tidal and geothermal energy).
Teaching methods and activities: Lectures and compulsory exercises. The midterm test accounts for 20% of the final grade. The midterm test will only count in a positive direction: If the result of the midterm test is worse than the result in the written examination, the final grade will be written examination only (100 %). The course will be given in English if students on the international master program are attending the course. A re-sit examination may be changed from written to oral.
Course materials: Will be given at semester start. Web based information from energy institutions and reserach institutes. The course uses "It's learning".
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	80/100	C
MIDTERM EXAMINATION		20/100	C

TFY4310 Molecular Biophysics

Lecturer: Professor Arnljot Elgsæter
Weekly hours: Autumn: 4F+3Ø+5S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Laboratory exercises

Learning objectives: The student shall attain a fundamental understanding of the basic molecular principles behind the physical properties of biopolymers and biopolymer systems, and be trained in central experimental methods for measurement of these properties.
Recommended previous knowledge: Basic physics, mathematics and chemistry.
Academic content: Covalent bonds. Orbital theory. Inter- and intramolecular interactions. Molecular dynamics. Hydrophobic interactions. Water-lipid interactions. Chain molecule conformations and statistic properties. Macromolecular rheology: Viscosity and viscoelasticity. Macromolecular gels. Translational and rotational diffusion. Centrifugation techniques. Nuclear spin resonance. Electron spin resonance. Optical absorption spectroscopy. Circular dichroism. Optical rotational dispersion. X-ray diffraction, fiber diagrams. Electron diffraction. Electron microscopy. Light scattering.
Teaching methods and activities: Lectures, voluntary problems and mandatory laboratory exercises. Teaching will be in English if students on international master programs are attending the course. A re-sit examination may be changed from written to oral.
Course materials: Elgsæter, Mikkelsen og Næss: Molekylær biofysikk, kompendium. English version in preparation.

Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	C

TFY4315 Biophysics (Special)

Lecturer: Professor II Einar K Rofstad
Coordinator: Professor Tore Lindmo
Weekly hours: Spring: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Laboratory exercises

Learning objectives: Introduction to the interaction of ionizing radiation in biomaterials, with emphasis on dosimetry and dose-modifying factors. Use of ionizing radiation in cancer therapy.
Recommended previous knowledge: Course TFY4225 Nuclear and Radiation Physics or equivalent is required. Knowledge of biochemistry (TBT4100 or equivalent) would be useful.
Academic content: This course gives an introduction to the deposition of energy from ionizing radiation in biomaterials. Topics presented are dosimetry at the macroscopic and microscopic level, repair and restitution processes, dose-response relationships, direct and indirect radiation effects, the oxygen effect, sensitizing and protective agents. Use of ionizing radiation in cancer therapy.
Teaching methods and activities: Lectures at NTNU. Mandatory laboratory assignments during excursion to the Norwegian Radium Hospital in Oslo. Teaching will be in English if students on international master programs are attending the course. A re-sit examination may be changed from written to oral.
Course materials: E. J. Hall: Radiobiology for the Radiologist, 5th edition, Lippincott Williams and Wilkins, 2000. Some supplementary material.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TFY4320 Medical Physics

Lecturer: Professor II Arne Skretting
Coordinator: Professor Tore Lindmo
Weekly hours: Spring: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Laboratory exercises

Learning objectives: Introduction to medical physics, with emphasis on different imaging modalities and the principles of medical imaging.
Recommended previous knowledge: Course TFY4225 Nuclear and Radiation Physics or equivalent is required.
Academic content: Medical imaging modalities based on nuclear medicine (SPECT, PET), X-ray computed tomography (CT), ultrasound, and magnetic resonance imaging. Theory for image formation, image noise, image reconstruction and image processing. Quality assurance of medical imaging diagnostics. Instrumentation for delivery and verification of radiation therapy. Electrical safety of medical equipment.
Teaching methods and activities: Lectures at NTNU. Mandatory laboratory assignments during excursion to the Norwegian Radium Hospital in Oslo. Teaching will be in English if students on international master programs are attending the course. A re-sit examination may be changed from written to oral.
Course materials: S. Webb: The Physics of Medical Imaging, Adam Hilger, 1990. Some supplementary material.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TFY4500 Biophysics, Specialization Project

Lecturer: Førsteamanuensis Jon Andreas Støvneng
Weekly hours: Autumn: 24S = 15.0 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Oral presentation of project work

Learning objectives: The student shall learn to attain in-depth knowledge of a specific subject area using scientific methods, i.e. acquire completing knowledge through literature studies and use of other sources. Furthermore, the student shall learn to complete a large independent project work, including setting up a project plan with milestones, reporting preliminary results and writing a project report according to established standards.
Recommended previous knowledge: Completed courses in the study programme for Applied Physics and Mathematics, within the study plan for Biophysics and Medical Technology, or equivalent.

Academic content: The specialization project comprises a workload of 15 ECTS. The Department of Physics announces project assignments relevant for the study direction Biophysics and Medical Technology.
Teaching methods and activities: Independent project work with academic supervision. In connection with the submission of the project report, there will be a seminar where the students give a compulsory oral presentation of their project work.
Course materials: To be announced at the start of the semester.
Assessment: Work

Forms of assessment	Date/Time	Percentage	Exam. support
EXCERCISES		100/100	

TFY4505 Biophysics, Specialization Course

Lecturer: Førsteamanuensis Jon Andreas Støvneng
Weekly hours: Autumn: 12S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The course shall give the student an in-depth knowledge of current interests within biophysics and medical technology.
Recommended previous knowledge: Completed courses in the study programme for Applied Physics and Mathematics, within the study plan for Biophysics and Medical Technology, or equivalent.
Academic content: The student chooses either one module of 7.5 credits or two modules of 3.75 credits form the following list:
TFY1 Magnetic Resonance Imaging (3.75 ECTS),
TFY2 Biophysical micromethods (7.5 ECTS),
TFY3 Energy and Environmental Physics (7.5 ECTS),
TFY4 Photobiophysics (3.75 ECTS),
TFY5 Physiology (3.75 ECTS),
TFY6 Radiation Therapy Physics (3.75 ECTS),
TFY7 Sensors and Transducers (7.5 ECTS),
TFY8 Nanoparticle and Polymer Physics (7.5 ECTS),
TFY9 Light Vision Colour (7.5 ECTS),
TFY10 Space Technology (3.75 or 7.5 ECTS).
Teaching methods and activities: The modules are given as lectures, colloquia, laboratory courses or self studies. Teaching will be in English if students on international master programmes are attending the course. A re-sit examination will be held within the examination period.
Course materials: To be announced at the start of the semester.
Assessment: Oral examination

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	100/100	D

FY2302 Biophysics I

Lecturer: Professor Thor Bernt Melø
Weekly hours: Autumn: 4F+1Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: ,

Learning objectives: An introduction to aspects of modern biophysics.
Recommended previous knowledge: Knowledge of elementary physics corresponding to one year study of physics.
Academic content: The subject is a general introduction to the essential processes of life, based on principles from physics. Transport processes, structure and function of proteins and deoxyribonucleic acids and membrane processes will be discussed. A few measurement techniques will also be covered.
Teaching methods and activities: Lectures, laboratory- and calculus excercises using EXCEL.
Course materials: Web-addresses and lecture notes. The material can be accessed through the home page of the cource.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
PORTFOLIO ASSESSMENT		1/1	

Department of Geology and Mineral Resources Engineering

TGB4135 Basin Analysis

Lecturer: Professor Stephen John Lippard
Weekly hours: Spring: 2F+3Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: To give an overview of the formation and development of sedimentary basins.
Recommended previous knowledge: Knowledge equivalent to Structural Geology and Sedimentology and Stratigraphy.
Academic content: Classification of sedimentary basins according to tectonic environment. Formation mechanisms of different basin types and controlling factors of sedimentary filling. Methods of evaluating the subsidence and thermal history of basins.
Teaching methods and activities: Lectures, exercises, colloquia. The course will be held in English if international masterstudents attend.
Course materials: P.A.Allen J.R. Allen: Basin analysis, Principles and Applications, Blackwell Scientific Publications.
Assessment: Oral examination

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	100/100	D

TGB4160 Petroleum Geology

Lecturer: Førsteamanuensis Sverre Ola Johnsen, Professor Stephen John Lippard, Professor Mai Britt E. Mørk
Coordinator: Førsteamanuensis Sverre Ola Johnsen
Weekly hours: Autumn: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The course aims at making the students comfortable with the processes leading to formation and accumulation of hydrocarbons in the earths crust. Further, to give the students an overview of the geological development and geological conditions on the Norwegian continental shelf and in other important petroleum provinces.
Recommended previous knowledge: BSc in geosciences.
Academic content: Composition and classification of petroleum. Conditions controlling primary production and accumulation of organic matter to petroleum. Primary and secondary migration of petroleum. Porosity and permeability in rocks. The role of depositional environment as a controlling factor for reservoir rock quality. Classification and formation of petroleum traps. Basin types and their petroleum potential. Principles of basin analysis. The geological development of the Norwegian continental shelf. Examples of Norwegian oil and gas fields. Geological conditions in some selected petroleum provinces in other parts of the world. The exercises include construction of burial graphs, maturation calculations, construction and interpretation of structure maps, thin section microscopy of potential reservoir rocks and a comprehensive exercise where the petroleum potential within a given area should be evaluated.
Teaching methods and activities: Lectures and exercises. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: J. Gluyas R.E. Swarbrick: Petroleum Geoscience,
Blackwell Publishing.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TGB4170 Diagenesis/Reservoir Quality

Lecturer: Professor Mai Britt E. Mørk
Weekly hours: Spring: 2F+2Ø+8S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: Processes determining reservoir rock quality like porosity, permeability, pressure and kerogenity.
Recommended previous knowledge: Recommended basic knowledge of sedimentology and chemistry.
Academic content: Physical and chemical changes in sediments from the depositional environment to deep burial. Factors that control destruction or preservation of porosity. Siliciclastic sediments and carbonates. Interpretation of "cases".
Teaching methods and activities: Lectures and obligatorial exercises. Colloquium where each student has an obligatorial presentation of selected topic. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: Articles and compendium.
Assessment: Written examination/Midterm

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	75/100	D
MIDTERM EXAMINATION		25/100	D

TGB4560 Petroleum Geology, Specialization Project

Lecturer: Førsteamanuensis Sverre Ola Johnsen, Professor Stephen John Lippard, Professor Mai Britt E. Mørk
Coordinator: Førsteamanuensis Sverre Ola Johnsen
Weekly hours: Autumn: 24S = 15.0 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The aim is to learn to spesialize in a given specific topic using scientific methods, including literature study, other sources of information, in combination with independent work. The student shall learn to plan, perform and report own research work following accepted standards.
Recommended previous knowledge: Recommended previous knowledge: subject combination required for the petroleum geology study according to the study plan. Exceptionally, alternatives agreed upon by the supervisor.
Academic content: Petroleum geology comprises the application and development of all geological and geophysical methods of importance to petroleum exploration, mapping and description of petroleum reservoirs, including data from borehole measurements. Specialization can be done within basin modelling, sedimentology, structural geology, diagenesis, reservoir geology, maturation and migration of petroleum.
Teaching methods and activities: Independent supervised project work.
Course materials: Informasjon will be given at semester start.
Assessment: Work

Forms of assessment	Date/Time	Percentage	Exam. support
EXCERCISES		100/100	

TGB4565 Petroleum Geology, Specialization Course

Lecturer: Førsteamanuensis Sverre Ola Johnsen, Professor Stephen John Lippard, Professor Mai Britt E. Mørk
Coordinator: Førsteamanuensis Sverre Ola Johnsen
Weekly hours: Autumn: 12S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The topics will provide specialisation in problems of relevance to petroleum geology.
Recommended previous knowledge: Advised previous knowledge: subject combination required for the petroleum geology study according to the study plan. Exceptionally, alternatives agreed upon by the scientific advisor.
Academic content: Two 3.75 sp topics or one 7.5 sp topic must be selected from the following list:
Geoscientific field course on Svalbard (førsteamanuensis Egil Tjåland), 3.75 sp.
Sedimentology (førsteamanuensis Sverre Ola Johnsen), 3.75 or 7.5 sp.
Tectonics, structure- regional geology (professor Stephen John Lippard), 3.75 or 7.5sp.
Reservoir geology, diagenesis (professor Mai Britt E. Mørk), 3.75 or 7.5 sp.
Plate tectonics and Basin formation (professor II Trond Torsvik), 3.75 or 7.5 sp.
Seismic imaging of sedimentary units, field course (professor Martin Landrø/førsteamanuensis Sverre Ola Johnsen), 3.75 sp.
Reservoir seismics (professor Bjørn Ursin), 3.75 or 7.5 sp.
Prospect evaluation (professor Richard Sinding-Larsen), 3.75 or 7.5 sp.
Geo-intelligence and hydrocarbon resources (professor Richard Sinding-Larsen), 3.75 or 7.5 sp.
Teaching methods and activities: Topics are normally given as supervised individual study, but can also include exercises, seminars of free-standing lectures. The course wil be held in English if international students attend. The exam will be arranged to be held within the end of the semester.
Course materials: Information will be given at semester start.
Assessment: Oral examination

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	100/100	D

TGB5100 Rock Engineering, Advanced Course

Lecturer: Professor Bjørge Brattli, Professor Einar Broch, Professor Charlie Chunlin Li, Professor II Ming Lu, Professor Bjørn Nilsen
Coordinator: Professor Bjørn Nilsen
Weekly hours: Autumn: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The course objective is to offer the students a deeper understanding of important key issues of rock engineering as described above.
Recommended previous knowledge: Basic course TGB5110 Geology and Tunneling, Basic Course TGB4185 Engineering Geology, or a similar basic level knowledge of geological engineering.
Academic content: Selected topics in rock engineering such as: Engineering geological investigations, rock mass properties, weathering of rocks, rock stress measurements, numerical modelling, rock slope stability, dam foundation, tunnelling in soft rocks, hydropower tunnels in swelling and squeezing rocks, cases of instability in tunnels, TBM excavation, etc.
Teaching methods and activities: Lectures, exercises, laboratory assignment, 3 days obligatory field course. Report based on field investigations is to be submitted and approved for admission to the exam. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: R.E.Goodman: Engineering Geology, John Wiley Sons, New York. Nilsen og Palmstrøm: Engineering Geology and Rock Engineering, NFF/NBG Handbook No. 2, 2000. Selected papers and lecture notes.

Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TGB5110 Geology and Tunnelling, Basic Course

Lecturer: Professor Einar Broch, Professor Bjørn Nilsen
Coordinator: Professor Einar Broch
Weekly hours: Spring: 4F+4Ø+4S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The course is offered in English to the students in the first year of the MSc programme Hydropower Development and third or fourth year of the siv.ing. studies in Civil and Environmental Engineering. The course covers the basics in engineering geology and tunnelling for civil engineers.
Recommended previous knowledge: Admission to the HPD MSc programme, admission to Civil and Environmental Engineering or similar. The course is a prerequisite for TVM5130 Hydropower Project.
Academic content: Basic engineering geology, rock mechanics, rock blasting and tunnelling for underground hydropower projects.
Teaching methods and activities: The lecturers come from the university and the hydropower industry, all with international experience. All lectures and exercises are given in English. The lectures will be concentrated during the first half of the spring semester to prepare for TVM5130. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: Books from the series "Hydropower Development" and supplementary lecture notes, all in English.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

Department of Industrial Economics and Technology Management

TIØ4120 Operations Research, Introduction

Lecturer: Post doktor Kjetil Fagerholt
Coordinator: Professor Marielle Christiansen
Weekly hours: Autumn: 4F+1Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The objective is to give the students some basic knowledge in Operations Research, such that they can increase their ability to model and solve decision problems with both technical and economic aspects.
Recommended previous knowledge: The course requires knowledge from basic courses in mathematics, statistics and computer science.
Academic content: The course deals with the use of mathematical models for planning of corporate and governmental activities. Most of the planning problems will consist of an economic objective which we want to maximise under scarce resources.
Operations Research consists of:
- to limit and define the current problem
- to formulate a mathematical model of the problem
- to calculate an optimal solution of the model
- to interpret and implement the found solution.

This course deals with both deterministic and stochastic problems, and they will be analysed within the following topics: Linear programming, simple integer programming, network flow models, multicriteria decision making, non-linear programming, decision analysis, simple queuing theory, simulation. We will use commercial software for formulating and solving mathematical programs.
Teaching methods and activities: Lectures, cases and exercises with and without computers. If there is a re-sit examination, the examination form may change from written to oral.
Course materials: Given at the start of the course.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN	To be announced on the web	100/100	C

TIØ4135 ICT Economics - Planning and Economics of Tele and Information Services

Lecturer: Professor Alexei A. Gaivoronski, Førsteamanuensis II Josip Zoric
Coordinator: Professor Alexei A. Gaivoronski
Weekly hours: Autumn: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: Develop capability for economic analysis, modeling and planning of modern telecommunications and information services and planning of telecommunication networks
Recommended previous knowledge: Knowledge which corresponds to TIØ4115 Microeconomics and Optimization and TIØ4125 Investments and Decisions under Uncertainty.
Academic content: Course is composed from three parts: Economics of networks, telecommunications and information industry, modeling of telecommunication systems with the help of the methods of operations research and managerial economics, and planning of competitive IKT services, in particular internet based services and mobile data services.
Teaching methods and activities: Lectures and seminar presentations. The course will be held in English.
Course materials: Is given at the beginning of semester.
Assessment: Oral examination

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	100/100	A

TIØ4140 Project Evaluation and Financing

Lecturer: Førsteamanuensis Stein-Erik Fleten, Førsteamanuensis Sjur Westgaard, Professor Dominicus van der Wijst
Coordinator: Førsteamanuensis Stein-Erik Fleten
Weekly hours: Spring: 3F+2Ø+7S = 7.5 Cr
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: To give a theoretical foundation regarding project evaluation and asset pricing under uncertainty. Training to think about general projects as a collection of real options. The students should aquire the skills necessary to analyse stylized projects under uncertainty, and to value and hedge cash flows coming from positions in common derivative financial securities.
Recommended previous knowledge: TIØ4145 Corporate Finance.
Academic content: The course builds on and expands the students' skills in financial theory and applications, focusing on asset/ option pricing theory in particular. This is used in analysing financial securities/instruments and real assets, and in project evaluation under uncertainty using real option analysis. The course includes a description of technical and economic characteristics of project risk and an option-based valuation of flexibility in projects. The knowledge and theory is also applied to analysis of compound financing strategies and financial instruments.
Teaching methods and activities: Lectures and exercises. The course language will be English if English speaking students are enrolled. If there is a re-sit examination, the examination form may change from written to oral.
Course materials: Assigned at course start.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN	To be announced on the web	100/100	A

TIØ4175 Industrial Management 4C - Logistics and Purchasing Management

Lecturer: Førsteamanuensis Luitzen de Boer
Weekly hours: Spring: 2F+3Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The course aims to provide insight into logistics and purchasing and, in particular, how companies are tied together in value chains and networks dominated by economic transactions. It is expected that students who take the course understand and master central concepts within the field as well as the challenges that the management in a company face when organising logistics and purchasing activities in order to contribute to value creation as well as interact with the environment of the company.
Recommended previous knowledge: Requires TIØ4265 Industrial Management 3 - Strategic Management or similar background.
Academic content: Historical development of the discipline; central concepts in logistics; control principles; strategic issues and co-ordination of manufacturing, purchasing and materials management; economic considerations related to logistical and purchasing decisions; logistics and purchasing as strategic tools; sourcing strategies and strategies for selection of suppliers; development of supplier relationships and networks; as well as use of information and communication technology within the fields of logistics and purchasing.

Teaching methods and activities: Lectures and assignments. The course will be taught in English if foreign students are registered. All course material is in English. If there is a re-sit examination, the examination form may change from written to oral.
Course materials: To be announced by the start of the semester.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN	To be announced on the web	100/100	D

TIØ4180 Innovation and Information Management

Lecturer: Førsteamanuensis Truls Erikson, Førsteamanuensis Alf Steinar Sætre
Coordinator: Førsteamanuensis Alf Steinar Sætre
Weekly hours: Autumn: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The goal of the course is to give the students an overview of, and understanding of, central problems and methods regarding innovation, product development and information management in existing organisations.
Recommended previous knowledge: This course assumes a basic knowledge of organization theory and organizational behavior. Requires TIØ4165 Industrial Management 2 - Marketing Management or similar background.
Academic content: The course incorporates the following themes: innovation in organizations, intrapreneurship and co-operation between companies regarding development projects. The course also deals with the connection between organization and innovation, innovation and design, and how communication- and decision-processes influence innovative processes in organizations, ICT and new forms of organizations, service, innovation, customer adaptation and information management and transformation.
Teaching methods and activities: The course uses both lectures and compulsory excercises. Some parts of the lectures may be done in the form of seminars. Marking is based 100% on excercises. The course is run in English.
Course materials: Will be available at course start.
Assessment: Work

Forms of assessment	Date/Time	Percentage	Exam. support
EXCERCISES		100/100	

TIØ4195 Environmental Management and Corporate Social Responsibility

Lecturer: Professor Annik Magerholm Fet, Amanuensis John Eilif Hermansen
Coordinator: Professor Annik Magerholm Fet
Weekly hours: Autumn: 4F+1Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The subject shall give knowledge, understanding and skills to support the endeavours for sustainability, better environmental management and industrial practise under the vision of sustainable development and corporate social responsibility. The subject shall give understanding of ethical dilemmas and show connections between environmental and social responcibility in global value chains.
Recommended previous knowledge: The course is compulsory for SHE branch students and can be choosen by students at the Indecol programme. Other students may attend by agreement with the Institute of Industrial Economics and Technology Management.
Academic content: The course departs from the principles of UNs Global Compact, the Global Reporting Initiatives GRI and Corporate Social Responsibility CSR, national and international environmental status and policy. It gives further insight into how environmental requirement from customers, authorities and other stakeholder in industrial networks and society impact the organization’s situation regarding competitiveness in a life cycle perspective. It further includes environmental management, CSR, legislation, international standards like EMAS and ISO-14000-standards Special attention is given to tools for environmental management like environmental analyses, LCA, environmental accounting, performance indicators, business environmental and sustainability reporting and auditing methodology.
Teaching methods and activities: Lectures and group based student works like lecturer, presentations and project work / field work connected to a company. Postponed/repeated exams may be oral.
Course materials: Is given at semester start.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN	To be announced on the web	60/100	D
EXCERCISES		40/100	

TIØ4205 Safety, Health and Environment - Methods and Tools in SHE Practice

Lecturer: Professor Jan Hovden, Professor II Urban Anders Gunnar Kjellen
Coordinator: Professor II Urban Anders Gunnar Kjellen
Weekly hours: Spring: 4F+1Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Term assignments

Learning objectives: The course will give knowledge of methods and tools for systematically and efficient preventive SHE-work in industrial organisations.
Recommended previous knowledge: TIØ4185 Safety, Health and Environment - Non-Industrial Work Environment, or similar background. The subject is compulsory for students at the section of Safety, Health and Environment. Other students can apply to the department to participate. Reserved students at SHE.
Academic content: The course presents principles and methods for identification and analysis of accident risks as well as principles and methods for development and implementation of effective preventive measures through experience feedback and learning. The main focus is on preventing occupational accidents; nevertheless prevention of major accidents and acute environmental discharges are discussed as well. A theoretical part of the course deals with accident models, safety measures and barriers and learning from unwanted events in organisations. Organisational and individual obstacles for efficient learning and prevention are dealt with. Methods and tools for accident and near-accident reporting and investigation, inspections, SHE information systems, job-safety analysis and risk assessment of machinery are presented. SHE-audits and analysis of accident data will be emphasized and put into practice in exercises. The course deals with methods for identification and evaluation of safe behavior, including human factors related to safety problems in complex socio-technical systems.
Teaching methods and activities: Lectures, study groups, exercises that includes field research in industrial companies, mid-term tests. Portfolio assessment is the basis for the grade in the course. The portfolio includes a final written exam (80%), and assignments (20%). The results for the parts are given in %-scores, while the entire portfolio is assigned a letter grade. The course can be held in English if international students attend. Postponed/repeated exams may be oral.
Course materials: U. Kjellén: Prevention of Accidents through Experience Feedback, Taylor og Francis.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN	To be announced on the web	80/100	A
EXCERCISES		20/100	

TIØ4235 Industrial Management 4B - Industrial Marketing and Internationalization

Lecturer: Førsteamanuensis Arild Aspelund, Førsteamanuensis Øystein Moen
Coordinator: Førsteamanuensis Arild Aspelund
Weekly hours: Spring: 2F+3Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Assignments

Learning objectives: The course is a graduate course in marketing and international business development. By taking this course it is expected that the students can: (1) understand and master the central concepts of industrial marketing, (2) master how to understand, create and deliver value to industrial customers, (3) understand and master central concepts of international business development, and (4) be able to use this knowledge in real cases.
Recommended previous knowledge: A precondition for the course is TIØ4265 Industrial Management 3 - Strategic Management or similar qualifications.
Academic content: The course is a graduate course for students with special interests in marketing and international business development. The course has two main parts and the first part will deal with challenges related to marketing and sales of industrial goods, especially how one understands, creates and delivers value to industrial customers. The other part treats international expansion. Here we will discuss the major challenges that firms meet when they expand their activities internationally. Challenges related to international marketing, international trade and and management of international value chains will be presented. Throughout the course it will be given examples from Norwegian and international firms in lectures and case discussions. The case discussions aim to illustrate how successful firms have overcome the challenges presented in the lectures and will demand some preparations from the participants. Students will be graded from term papers that can be delivered individually or in groups and will be focused on issues related to industrial marketing and international expansion.
Teaching methods and activities: Lectures, case discussions and mandatory assignments. The course will be held in English if there are non-Norwegian speaking participants.
Course materials: To be announced at course start.
Assessment: Work

Forms of assessment	Date/Time	Percentage	Exam. support
EXCERCISES		100/100	

TIØ4265 Industrial Management 3 - Strategic Management

Lecturer: Førsteamanuensis Elsebeth Holmen, Professor Olav Solem
Coordinator: Førsteamanuensis Elsebeth Holmen
Weekly hours: Autumn: 2F+3Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The course provides an introduction to strategic management. The course aims to enable the students (1) to understand central issues, concepts, and methods within the strategic management of firms and (2) to apply this understanding in analyses and discussions of various company cases. The topic is mandatory for all students with a specialisation in Business administration.
Recommended previous knowledge: TIØ4165 Industrial Management 2, or similar.
Academic content: Overview of 'schools of thought' within strategic management. The mind of the strategist. Forming, implementing, managing, and changing strategy. Tools and methods for strategic management at the business unit level versus the corporate level. Managing formal, respectively, informal strategic collaboration. Managerial and organisational issues when adopting new strategies. Strategy and globalisation. Company mission.
Teaching methods and activities: Lectures, case discussions and compulsory exercise. A written, group-based exercise is compulsory; it is to be handed in towards the end of course and counts for 40% of the grade. A written exam by the end of the course constitutes the remaining 60% of the grade. In cases of re-examination, an oral exam may substitute the written exam. If English-speaking students attend, the course will be given in English.
Course materials: Textbook and articles. To be announced.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN	To be announced on the web	60/100	A
EXCERCISES		40/100	

TIØ4270 Human Resource Management

Lecturer: Amanuensis Steinar Nygaard
Weekly hours: Spring: 2F+3Ø+7S = 7.5 Cr
Time: Not lectured in study year 2007-2008
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The students shall have knowledge and skills neccessary to manage and develope human resources in sustainable, productive organizations.
Recommended previous knowledge: Basic knowledge of organizational theory and/or organizational and work psychology.
Academic content: The concepts of work and organizing. Personnel strategy and policy. Planning, selection and termination of human resources. Performance management, remuneration, competence. Labour law and rules of work life. Ethical topics.
Teaching methods and activities: Lectures and discussions. 6 exercises, 4 of which must be approved before beeing permitted to examination.
Portfolio assessment is the basis for the grade in the course. The portfolio includes a final written exam (50%) and the four approved exercises (50%). The results for the parts are given in %-scores, while the entire portfolio is assigned a letter grade. Postponed/repeated exams may be oral.
Course materials: Assigned at course start.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN	To be announced on the web	50/100	C
EXCERCISES		50/100	

TIØ5200 Project Management 3 - Project Organizations

Lecturer: Førsteamanuensis Bjørn Otto Elvenes, Førsteamanuensis Tim Kristian Andreas Torvatn
Coordinator: Førsteamanuensis Bjørn Otto Elvenes
Weekly hours: Autumn: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The course introduces the student to theories and experiences regarding the organizing and management of projects and groups. Exercises and class room discussions encourages the student to reflect upon the relevance and usefulness of different theories and to search for alternative solutions to practical problems.
Recommended previous knowledge: For students of the International Master Degree in Project Management. A small number of other students can be admitted after application to the department. The course is held in English if foreign students are present.
Academic content: Introduction to systems thinking and systems theory. Systems regulation and management. Project environment. From need to specification. Fundamental principles of organizing and organizational design. Organizing project

structures. Establishing and organizing group work. Tools for enhancing group productivity and effectiveness. Motivating project groups. Project leadership. Project politics
Teaching methods and activities: Lectures and group based exercises. Class room discussion. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: To be announced at startup.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN	To be announced on the web	100/100	C

TIØ5210 Project Management 5 - Programme and Portfolio Management

Lecturer: Førsteamanuensis Bjørn Otto Elvenes, Førsteamanuensis Tim Kristian Andreas Torvatn
Coordinator: Førsteamanuensis Bjørn Otto Elvenes
Weekly hours: Spring: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: To understand how to handle a portfolio of projects, how to manage multi- and inter-organisational projects and how to evaluate a number of projects when not all can be chosen.
Recommended previous knowledge: Course TIØ5200 Project Management 3 or similar background. The course is meant for students following the International Master in Project Management. The course is run in English.
Academic content: The course contains the following parts: The project environment, stakeholders, uncertainty in environments, multi-project management, the project office, learning across projects, handling project managers, programme management, co-ordination among projects, interorganisational projects and choosing between projects.
Teaching methods and activities: Portfolio assessment is the basis for the grade in the course. The portfolio includes a final written exam (50%) and exercises (50%). The results for the parts are given in %-scores, while the entire portfolio is assigned a letter grade. Postponed/repeated exams may be oral.
Course materials: To be announced.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN	To be announced on the web	50/100	A
EXCERCISES		50/100	

TIØ5215 Project Management 6 - SHE and Purchasing in Projects

Lecturer: Førsteamanuensis Bjørn Otto Elvenes, Amanuensis John Eilif Hermansen, Førsteamanuensis Tim Kristian Andreas Torvatn
Coordinator: Førsteamanuensis Tim Kristian Andreas Torvatn
Weekly hours: Spring: 2F+3Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The aim of the SHE-part of the subject is to develop understanding and skill, and provide for knowledge on how environmental and SHE-management can be an integrated part of project organisations and enterprises and thus contribute to solving the environmental and SHE requirements and challengers of the enterprises. The aim of the purchasing/ contract-part of the subject is to teach the student how to handle projects in relations to purchasing, both as customer and as a project organisation. Both theoretical understanding and some practical methods will be taught.
Recommended previous knowledge: Course TIØ5200 Project Management 3 or similar background. The subject is designed for the International Master in Project Management. The course is in English.
Academic content: The course deals with challenges related to Safety-, Health and Environment work in projects and project-like organizations. International agreements and the environment in a global setting is an important parts of this. Furthermore, the course deals with challenges related to purchasing in projects and to projects as a way of doing purchasing. Within this part, both commercial and legal challenges will be presented.
Teaching methods and activities: Portfolio assessment is the basis for the grade in the course. The portfolio includes a final written exam (60%) and exercises (40%). The results for the parts are given in %-scores, while the entire portfolio is assigned a letter grade. Postponed/repeated exams may be oral.
Course materials: To be announced.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN	To be announced on the web	60/100	A
EXCERCISES		40/100	

TIØ5225 Project Management, Specialization Course

Lecturer: Førsteamanuensis Elsebeth Holmen, Førsteamanuensis Ann-Charlott Pedersen, Førsteamanuensis Tim Kristian Andreas Torvatn
Coordinator: Førsteamanuensis Ann-Charlott Pedersen
Weekly hours: Autumn: 2F+3Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The goal of the theory subjects is to allow students to specialise within a particular branch of project management.
Recommended previous knowledge: Students taking this course must also take TIØ5230 Project Management, Specialization Project. The student must have a background that corresponds to at least five of the obligatory courses in the first year of the Master of Science in Project Management.
Academic content: The student need to take the following two theory subjects in this course:
- TIØ7 Qualitative Methods (3.75 credits).
- TIØ8 Quantitative Methods (3.75 credits).
- TIØ10 Inter-organisational Projects (3.75 credits).

Teaching methods and activities: The theory subjects will be held in seminars and contain lectures, student presentations and discussion. The re-sit exam for the theory subjects is arranged at the end of the same exam period as the ordinary exam.
Course materials: Announced at the start of the semester.
Assessment: Oral examination

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	100/100	D

TIØ5230 Project Management, Specialization Project

Lecturer: Førsteamanuensis Elsebeth Holmen, Førsteamanuensis Ann-Charlott Pedersen, Førsteamanuensis Tim Kristian Andreas Torvatn
Coordinator: Førsteamanuensis Ann-Charlott Pedersen
Weekly hours: Autumn: 24S = 15.0 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The goal is to teach students to produce an academic report within their field of specialization.
Recommended previous knowledge: Students taking this course must also take TIØ5225 Project Management, Specialization Course. The student must have a background that corresponds to at least five of the obligatory courses in the first year of the Master of Science in Project Management.
Academic content: The students need to have their choice of specialization and project approved by the department during the semester before they want to take this specialization project. A list of possible projects will be available before the students need to choose specialization. Each project might have its own requirement for 4th year courses and needed theory subjects in the specialization course. The project supervisor needs to approve the students choice of theory subjects. The actual academic content will vary with the chosen project.
Teaching methods and activities: The project is a large, written exercise and is supervised by the scientific staff. The project should result in a written report judged by academic standards. The project is done alone or in groups of up to three students.
Course materials: Depends on the project chosen.
Assessment: Work

Forms of assessment	Date/Time	Percentage	Exam. support
EXCERCISES		100/100	

Department of Structural Engineering

TKT4135 Mechanics of Materials

Lecturer: Professor Kjell H. Holthe
Weekly hours: Spring: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The topic will give the theoretical basis for plastic calculations. The students will be able to carry out such calculations for simple structural elements and to estimate limit loads for foundations and forming processes.
Recommended previous knowledge: Knowledge corresponding to the course TKT4122 Mechanics 2.
Academic content: Anisotropic elasticity and symmetry planes.
Mechanical models for linear viscoelasticity.

Plasticity theory: Stress and strains, Flow critera, Non-hardening plasticity, Slip line fields, Limit analysis, Flow curve, Plasticity with hardening.
Teaching methods and activities: Lectures and compulsory exercises. The midterm examination will be weighted in a positive way only. If there is a re-sit examination, the examination form may be changed from written to oral. The lectures and exercises are in English when students who do not speak Norwegian take the course.
Course materials: D.W.A. Rees: Basic engineering plasticity.
Assessment: Written examination/Midterm

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	80/100	C
MIDTERM EXAMINATION		20/100	C

TKT4150 Biomechanics

Lecturer: Professor Leif Rune Hellevik, Professor Bjørn Helge Skallerud
Coordinator: Professor Bjørn Helge Skallerud
Weekly hours: Spring: 4F+1Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The course provides knowledge to the mechanical behaviour of the main tissues and materials in the human body, e.g. blood, bone, cartilage and muscles. Furthermore, one gets the link from the methods to some clinical applications such as stenosed blood vessels, congestive heart failure, osteporosis, arthritis.
Recommended previous knowledge: The course is based on basic courses in solid and fluid mechanics. Some background in continuum mechanics is recommended.
Academic content: With basic relationships from solid and fluid mechanics, rheology, and continuum mechanics the following topics are addressed: visco-elastic properties of biofluids and biosolids, blood rheology, blood flow in arteries and veins, mechanical behaviour of skeletal muscles/heart muscle, mechanical properties of tissues such as bone and cartilage. Some parts will be based on current research in biomechanics carried out at NTNU. Some exercises are mandatory.
Teaching methods and activities: Lectures, mandatory exercises and lab. 2/3 of the exercises approved is minimum for exam admittance. A midterm test has 25% weight of final grade. Postponed/repreated exams may be oral. The lectures and exercises are in English when students who do not speak Norwegian take the course.
Course materials: The course uses selected topics from Y.C.Fung. The lecture notes by F. Irgens is the basis for the course.
Assessment: Written examination/Midterm

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	75/100	D
MIDTERM EXAMINATION		25/100	D

TKT4201 Structural Dynamics

Lecturer: Post doktor Anders Rönnquist, Professor Einar Norleif Strømmen
Coordinator: Professor Einar Norleif Strømmen
Weekly hours: Autumn: 3F+3Ø+6S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Excercises

Learning objectives: The course is intended to provide necessary knowledge for the determination of structural response from dynamic loads, and experience in the modelling and calculation of dynamic response for simple structural systems.
Recommended previous knowledge: In the autumn 2007 this course is only given for students at the MSc programme Geotechnics and Geohazards. The course assumes basic knowledge of the finite element method for beams and frames, mass point dynamics and Fourier-analysis. The lectures will be given in English if necesssary.
Academic content: The following is covered: The single-degree-of-freedom system. Response of dynamic loads by superposition in time and frequency domain. Time domain integration. Continuous systems (partial differential equations), generalised single-degree-of-freedom systems, dynamic respons by modal superposition. Damping mechanisms and models. The equation of motion in a matrix format. Numeric solution to the problem of free oscillations. Direct solution of the equation of motion in time and frequency domain. Response calculations for relevant load cases (e.g. wind and earthquake).
Teaching methods and activities: Lectures and model illustrations. Numerical and computer exercises. Laboratory projects and demonstrations of dynamic response of simple structural models. The course will be given in English if necessary. At the re-sit exam the examination form may be written or oral.
Course materials: A.K. Chopra: Dynamics of structures, 2nd ed., Prentice Hall, 2001. Lecture notes.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TKT4225 Concrete Technology 2

Lecturer: Professor Karl Vincent Høiseth, Professor II Magne Maage, Professor II Roar Myrdal, Professor Øystein Vennesland
Coordinator: Professor Øystein Vennesland
Weekly hours: Spring: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Literature paper

Learning objectives: The course shall give the students both theoretical and practical knowledge about maintenance and repair of concrete structures. The most common types of deterioration mechanisms as well as and principles for structural assessment of concrete structures are described.
Recommended previous knowledge: Exam in the course TKT4215 Concrete Technology 1.
Academic content: Mechanical, physical, chemical and electrochemical deterioration mechanisms. Planning and execution of structural assessment. Test loads. Evaluation of the need for maintenance and repair. Service life evaluation. Maintenance- and repair- materials and methods. Strengthening. Quality control of repair works.
Teaching methods and activities: Lectures, colloquiums, group works and exercises. If there is a re-sit examination, the examination form may be changed from written to oral. The lectures and exercises are in English when students who do not speak Norwegian take the course.
Course materials: Compendium in English.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

Department of Mathematical Sciences

TMA4120 Calculus 4K

Lecturer: Førsteamanuensis Espen Robstad Jakobsen
Weekly hours: Autumn: 4F+2Ø+6S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The course will give insight and understanding into how complex function theory and transformation methods can be used to solve practical problems. The students will be able to solve certain types of ordinary and partial differential equations and to integrate functions of one complex variable.
Recommended previous knowledge: The course is based on TMA4100/05/10/15 Calculus 1/2/3 or equivalent.
Academic content: Complex functions, complex integration, Laurent series and calculation of residues. The Laplace transform with applications to solving ordinary differential equations and integral equations. Fourier series and the Fourier transform with applications to solving linear partial differential equations.
Teaching methods and activities: Lectures, compulsory exercises. Course grade is based on a written final exam (100%). Retake of exam may be given as an oral exam.
Course materials: Will be announced at the start of the semester.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	C

TMA4255 Design of Experiments and Applied Statistical Methods

Lecturer: Førsteamanuensis John Sølve Tyssedal
Weekly hours: Spring: 4F+1Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The objective of the course is to give the students a solid foundation for use of basic statistical methods in industry and technology. In addition the students shall be capable of planning collection of data and to use statistical software for analysing data. The course is primarily for students who do not attend the Industrial Mathematics Programme.
Recommended previous knowledge: The course is based on TMA4240/4245 Statistics, or equivalent.
Academic content: Hypotheses testing. Design of experiments. Analysis of variance. Transformations. Estimation of uncertainty in estimates. 2^k-experiments and fractions of these. Special designs. Response surface methods. Simple and multiple linear regression. Residual plots and selection of variables. Contingency tables. Statistical process control. Non-parametric methods.
Teaching methods and activities: Lectures and exercises with the use of a computer (computing programme MINITAB). Portfolio assessment is the basis for the grade awarded in the course. This portfolio comprises a written final examination 80% and selected parts of the exercises 20%. The results for the constituent parts are to be given in %-points, while the grade for the

whole portfolio (course grade) is given by the letter grading system.The course may be given in English if sufficiently many students don't master Norwegian. Retake of examination may be given as an oral examination.
Course materials: R. E. Walpole, R. H. Myers, S. L. Myers and K.Ye: Probability and Statistics for Engineers and Scientists, 7th ed., Prentice Hall, 2002.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	80/100	A
EXCERCISES		20/100	

TMA4270 Multivariate Analysis

Lecturer: Førsteamanuensis Mette Langaas
Weekly hours: Autumn: 4F+1Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The course gives a theoretical introduction to statistical methods for multivariate data (i.e. several variables are measured for each observational unit, and we are interested in using all the variables and their correlation). The students shall be capable of conducting simple statistical analyses of multivariate data using the programming package R.
Recommended previous knowledge: Subject TMA4240/TMA4245 Statistics or equivalent. The subject require a mature understanding of statistics and we recommend also the subjects TMA4260 Industrical Statistics or TMA4255 Design of Experiments and Applied Statistics. A good background in matrix methods is also a requirement (for example the course TMA4145 Linear Methods).
Academic content: Multivariate normal distribution, estimation and hypothesis testing for the multivariate normal distribution, multivariate linear regression, prinsipal components, factor analysis, disciminant analysis, classification and cluster analysis.
Teaching methods and activities: Ledtures, exercises, project/term paper. The exercises demand the use of a computer (computing programme R). The lectures may be given in English. Portfolio assessment is the basis for the grade awarded in the course. This portfolio comprises a written final examination 80% and the semester assignment 20%. The results for the constituent parts are to be given in %-points, while the grade for the whole portfolio (course grade) is given by the letter grading system. Retake of examination may be given as an oral examination.
Course materials: Johnsen Wichern: Applied Multivariate Statistical Analysis, Prentice Hall.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	80/100	C
EXCERCISES		20/100	

TMA4275 Lifetime Analysis

Lecturer: Professor Bo Henry Lindqvist
Weekly hours: Spring: 4F+1Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The course gives the theoretical foundation for stochastic modeling and statistical analysis of lifetime data, with emphasis on applications in reliability analysis and medicine. The student will through the mandatory exercises be able to use the theory on realistic data.
Recommended previous knowledge: Courses TMA4240/TMA4245 Statistics or equivalent. It will be an advantage to have taken one of the courses TPK4120 Industrial Safety and Reliability, TMA4260 Industrial Statistics, and TMA4255 Design of Experiments and Applied Statistical Methods.
Academic content: Basic concepts in lifetime modelling. Censored observations. Nonparametric estimation and graphical plotting for lifetime data (Kaplan-Meier, Nelson-plot). Estimation and testing in parametric lifetime distributions. Analysis of lifetimes with covariates. (Cox-regression, accelerated lifetime testing). Modelling and analysis of recurrent events. Nonhomogeneous Poisson-processes. Nelson-Aalen estimators. Bayesian lifetime analysis.
Teaching methods and activities: Lectures and exercises with the use of a computer (MINITAB). The lectures may be given in English. Portfolio assessment is the basis for the grade awarded in the course. This portfolio comprises a written final examination 80% and selected parts of the exercises 20%. The results for the constituent parts are to be given in %-points, while the grade for the whole portfolio (course grade) is given by the letter grading system. Retake of examination may be given as an oral examination.
Course materials: To be announced at the start of the course.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	80/100	B
EXCERCISES		20/100	

TMA4300 Modern Statistical Methods
Lecturer: Førsteamanuensis Håkon Tjelmeland
Weekly hours: Spring: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: This subject gives an introduction to modern computer based techniques for statistical inference. The students will through the mandatory exercises be capable of applying the theory in simple situations.
Recommended previous knowledge: Subject TMA4240/TMA4245 Statistics. The subject require a mature understanding of statistics and we also recomend TMA4265 Stochastic Processes and TMA4270 Multivariate Analysis.
Academic content: Classical methods for stochastic simulation, Markov chain Monte Carlo methods. Graphical models, networks and Bayesian inference. Bootstrapping, cross-validation and non-parametric methods. Classification.
Teaching methods and activities: Lectures and compulsory exercises on a computer. The lectures may be given in English. Portfolio assessment is the basis for the grade awarded in the course. This portfolio comprises a written final examination 60% and an exercise 40%. The results for the constituent parts are to be given in %-points, while the grade for the whole portfolio (course grade) is given by the letter grading system. Retake of examination may be given as an oral examination.
Course materials: Will be announced at the start of the course.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	60/100	C
EXCERCISES		40/100	

Department of Engineering Design and Materials

TMM4165 Joining Technology
Lecturer: Professor Einar Halmøy
Weekly hours: Autumn: 4F+1Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The course should give a basic introduction to welding, brazing/soldering and adhesive bonding as important methods of production and how they affect properties of materials and products. Emphasis is on welding.
Recommended previous knowledge: Basic course in materials science required.
Academic content: Welding: Physical basis of arc welding. Arc welding methods. Solid state welding. Laser and electron beam welding. Automation. Thermal cutting. Heat distribution in the work piece. Stresses and deformation. Design with welding. Welding metallurgy. Welding defects and fracture. Cost of welding production. Non-destructive testing. Brazing/soldering: methods and properties. Adhesive bonding: methods and properties.
Teaching methods and activities: Lectures and video. Voluntary calculation and descriptive excercises. Compulsory laboratory will be scheduled. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: Lecture notes. Handbooks.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

Department of Marine Technology

TMR4115 Design Methods
Lecturer: Professor II Stein Ove Erikstad
Weekly hours: Autumn: 3F+6Ø+3S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The course will give a foundation for understanding and applying mathematical programming and operations research for decision support and optimization in relation to design of marine systems.
Recommended previous knowledge: The students should have basic knowledge about marine systems design.
Academic content: Design process modelling. Evaluating and selecting among alternative design solutions, utility theory. Design as optimization. Linear programming, interpreation of primal and dual variables. Analytical solution to non-linear problems. Heuristic methods applied on non-linear models, genetic algorithms. Simulation models. Basic decision theory. Network optimization. Software tools for optimization.
Teaching methods and activities: Learning is based on both ordinary classes and assignments. The assignments focus on applying methods using databased tools. The term paper will focus on the practical application of the models and methods

covered in the course. Portfolio assessment is the basis for the grade in the course. The portfolio includes a final written exam (70%) and exercises (30%). The results for the parts are given in %-scores, while the entire portfolio is assigned a letter grade. Postponed/repeated exams may be oral.
Course materials: Hillier og Lieberman: Introduction to Operation Research. Lecture notes and papers.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	70/100	C
EXCERCISES		30/100	

TMR4120 Underwater Engineering, Basic Course

Lecturer: Førsteamanuensis Ludvig Karlsen
Weekly hours: Spring: 3F+6Ø+3S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: Obtain a basic understanding of the processes in the ocean and design, contruction and working principle of various underwater systems. The course forms the basis for more advanced courses in underwater technology.
Recommended previous knowledge: TMR4105 Marine Technology 1, TMR4167 Marine Technology 2 and TMR4247 Marine Technology 3 or equivalent.
Academic content: In the introduction ocean sea water composition and properties is dealt with, also with purpose to serve as basis for the understanding of sound transmission, light conditions and primary production in the oceans, and explains how this knowledge is applied in instruments for positioning, signal transfer, mapping, measurements and experimental samling. The main course content deals with systems for transport and operation in the ocean space as well as methods for calculation of the influence of the ocean current and vessel movement on hanging loads and ROVs. Also design, operation and evaluation of the properties of manned, remote controlled and autonomous systems are dealt with.
Teaching methods and activities: Lecture, practical training with ROV, a larger project work parallell with the lecture as group work. All group members will in principle get the same marks.
Course materials: Various text bokks, lecture notes and relevant available information on internet.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
EXCERCISES		75/100	
MIDTERM EXAMINATION		25/100	D

TMR4125 Building of Ships and Platforms

Lecturer: NN
Weekly hours: Spring: 3F+3Ø+6S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises, Project

Learning objectives: The main objective is to teach the common knowledge of marine building technology and focus on factors which are important to the cometitiveness.
Recommended previous knowledge: None.
Academic content: The course starts with identification of actors in building projects, i.e. shipyards, building companies, engineering companies, classification soc., authorities, ship owners, oil companies and vendors.
The course is an introduction to building of ships and platforms through the life cycle of projects. Management of building as well as the performing of the building with focus on technology is included. The lecturing gives an understanding of the building process, the building methods ond the design of ships and platforms. Principles and methods are explained for the purpose of reuse for new unknown constructions. Special attention is paid to factors which are important to the competitiveness of projects.
Teaching methods and activities: Lectures, excursions, exercises. The course is part of the MSc program and will be lecured in English when applied to this program. Portfolio assessment is the basis for the grade in the course. The portfolio includes a final written exam (50%) and exercises (50%). The results for the parts are given in %-scores, while the entire portfolio is assigned a letter grade. Postponed/repeated exams may be oral.
Course materials: Ola Westby: Textbook on internet. Title : "Marine Building Technology". Address : http:// tigris.marin.ntnu.no/byggeteknikk/
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	50/100	D
EXCERCISES		50/100	

TMR4130 Risk Analysis and Safety Management of Maritime Transport

Lecturer: Professor Svein Kristiansen
Weekly hours: Autumn: 2F+8Ø+2S = 7.5 Cr
Time: Teaching time and location will be announced on the web.

Grade: Letter grade Compulsory assignments: None

Learning objectives: Present the basic issues relating to the improvement of safety at sea. Give the theoretical and practical basis for risk analysis of maritime systems. Discuss central ideas on how safety can be improved through organization and management controls.
Recommended previous knowledge: TMR4110 Marine Design and Marine Engineering, Basic Course 1 (see catalogue 2006/ 07), or equivalent.
Academic content: The risk concept. What is an accident? Risk picture. Accident statistics. Preventive and ameliorating measures. Safety mangament - monitoring of the risk level. Risk objectives and data. Statistical analysis of safety oriented decision alternatives. Maritime traffic models. Probability of grounding and collision. Risk analysis methods: Hazard analysis, FTA, ETA, FMECA, HazOp. Formal safety assessment (FSA). Cost-benefit analysis of safety measures. Analysis and modelling of ship casualties. Benefit-cost analysis of controls. Analysis and modelling of ship accidents. Human reliability and error mechanisms. Catastrophe behaviour, evacuation and rescue. Training, drills and human-machine simulation. Regulation and official control of maritime safety. National and international control authorities. Safety and quality management. ISO standards. Auditing. Safety Case.
Teaching methods and activities: Lectures and assignments.
Course materials: Textbook: Kristiansen, S.: Maritime Transportation - Safety Management and Risk Analysis. Elsevier - Butterworth Heinemann, Amsterdam. ISBN 07506 59998.
Assessment: Work

Forms of assessment	Date/Time	Percentage	Exam. support
EXCERCISES		100/100	

TMR4135 Fishing Vessel and Workboat Design

Lecturer: Professor Harald Ellingsen, Professor Anders Endal
Coordinator: Professor Harald Ellingsen
Weekly hours: Autumn: 2F+8Ø+2S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The course shall enable the students to design fishing vessel, workboats and small vessels with due regard for the boundary conditions and functional requirements governing their operations
Recommended previous knowledge: Basic knowledge of marine technology.
Academic content: Basic fishery ecology, ocean environment, fisheries management, laws and regulations. Main principles for concept development and design of such vessels. The use of LCA, modelling and analyses of fishing operations as design tools. Fishing methods, catch handling methods,deck machinery systems for gearhandling and catch-handling. Principles and instrumentation for fish finding and navigation. Ergonomics and safety considerations in wheelhouse-, accommodation- and fishing system design. Methods for estimating forces from towed objects, fishing gear and lifting gear and their effect on safety and stability. Resistance and powering calculations for fishing vessels and workboats, operating profiles for machinery systems with highly variable loading. Design of such systems for minimum fuel consumption.
Teaching methods and activities: The course consists of two main parts:
1.Lectures/informal, colloquial group based discussions 2. A team based vessel design project. Student groups/lecturer introduce themes for discussions. Types of work boats to be discussed and guest lecturers to be invited decided in consultstion with the students.
Course materials: Lecture notes.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	50/100	D
MIDTERM EXAMINATION		25/100	D
EXCERCISES		25/100	

TMR4137 Sustainable Utilization of Marine Resources

Lecturer: Professor Anders Endal
Weekly hours: Autumn: 4F+6Ø+2S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises - Project

Learning objectives: Objectives: To give students from different departments/disciplines studying Costal Zone Development a common platform enabling them to communicate and cooperate efficiently in multi-disciplinary activities and projects. The course shall enable the students to describe and understand the most important physical and biological processes in the oceans, important elements i marine technology, basic element in marine systems design, as well as some knowledge of methods for project evaluation. One objective is to enable the students to combine knowledge of the physical and biological marine systems with insight into the design, construction and operation of man-made technical and biological system for sustainable utilization of living resources in the sea.

Recommended previous knowledge: None.
Academic content: The course consists of several topics that are partly taught in parallel and partly integrated to obtain a holistic approach to marine knowledge. The first topic encompass an introduction to the energy flow and the most important physical processes in the atmosphere and the oceans, climate and the oceans, biological production processes in the sea, the energy flow in the marine food web, the most important living marine recourses, our most important species and fish stocks. Methods for surveillance, modelling and protection of the fish stocks are presented. The next theme deals with the history of fisheries and the present global and national situation in fisheries and aquaculture, national and international law, marine recourse management as well as national rules and regulations. Furthermore, an introduction to ethical questions is given, as well as insights into conflicts and conflict resolution, relations between fishers and fisheries management, principles for sustainable development and responsible fishing. Attention is also given to marine technology, ist history, development and usage in fishery- and aquaculture systems. The effects of technology on the environment, the consequences of energy intensive fishing, unwanted catch, by-catches, ghost-fishing and the use of selective fishing gears is also dealt vith.These questions will be illuminated by a variety of lab- exercises excursions as well as demonstrations on board the University's research vessel. The fourth theme deals with the value-chain in fisheries and aquaculture, production and productivity is defined, simple linear models for production in fisheries and aquaculture are demonstrated as well as simple methods for technical, biological and economic design of systems for fishing and aquaculture, Methods and criteria used for project evaluation are also dealt with.
Teaching methods and activities: Teaching methods and activities: Lectures, mandatory laboratory exercises including demonstrations on NTNU's research vessel, a compulsory project, the final report of which is to be presented/lectured for the rest of the students. The approved reports will become come part of the curriculum. Lectures, presentations, lab-work and writing assignments to be carried out as teamwork.
Course materials: Lecture notes, exercise guidance notes.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	50/100	D
MIDTERM EXAMINATION		20/100	D
EXCERCISES		30/100	

TMR4140 Design of Marine Production Plants

Lecturer: Førsteamanuensis Ludvig Karlsen
Weekly hours: Spring: 3F+6Ø+3S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The students shall obtain the skill and basic knowledge to be able to design open sea fish farms as well as fish catching systems.
Recommended previous knowledge: TMR4110 Marine Design and Marine Engineering Basic Course 1 (see catalogue 2006/ 07), or equivalent.
Academic content: Course content: In the introductory part actual fish species, included their environmetal requirements, Governmental laws and regulations for farming in Norway and environmental conditions included coastal topography are delt with.
The main part deals with various types of open sea (net cage) farms, floating platforms, net volumes, current forces and volume deformation as well as achoring and net weighting. Also fish catching systems, both active and passive, are delt with in the course.
Teaching methods and activities: The course includes class lectures, exercises, project group work and excursions to commercial sea farms and/or farm equipment producers.
Course materials: L. Karlsen: Various lecture notes.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	50/100	D
EXCERCISES		50/100	

TMR4145 Product Modelling and Design

Lecturer: NN
Weekly hours: Spring: 2F+2Ø+8S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The main objective is that the students shall learn how to use CAD systems in design, product modelling and visualization.
Recommended previous knowledge: Fundamental knowledge in using CAD systems is profitable.
Academic content: Introduction on modelling functions etc. Commercial use of CAD. Presentation techniques. Standards for modelling.3D models.Conceptual and detailed design with CAD. Parametric design. Animation and related techniques as a

means to design and presnetation of products. Discipline specific applications.Links to analysis. Virtual reality. Problems solved by teams are supervised exercise in design.
Teaching methods and activities: Individual exercises and supervised teamwork complemented by lectures. Final presentation of teamwork.
Course materials: Textbooks, manuals and tutorials.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
EXCERCISES		75/100	
MIDTERM EXAMINATION		25/100	A

TMR4175 Marine Structures, Basic Course

Lecturer: Professor Bernt Johan Leira
Weekly hours: Autumn: 12S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: To make the students able to compute stresses and deformations in ships and marine structures due to still-water and wave-induced loads, and also to understand the load-carrying functionality of such structures.
Recommended previous knowledge: Marine structural engineering from Technical University College.
Academic content: The course deals with the load-carrying functionality, load-effect analysis and design of ships and marine structures. The following topics are addressed: Wave-induced loads on ships. Analysis of shell- and plate-structures. Numerical methods including series solutions for plates. Plate buckling and solution methods based on energy formulations. Buckling of plate panels. Stress analysis of ships and marine.
Teaching methods and activities: Mainly self-study.
Course materials: Compendiums.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	70/100	D
MIDTERM EXAMINATION		30/100	C

TMR4180 Marine Dynamics

Lecturer: Professor Carl Martin Larsen, Professor Dag Myrhaug
Coordinator: Professor Carl Martin Larsen
Weekly hours: Spring: 4F+6Ø+2S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The principles and methods relevant to dynamic response of marine structures will be explained.
Recommended previous knowledge: Basic knowledge in dynamics at BSc/BEng-level or similar, TMR4210 Marine Hydrodynamics and Structures, Basic Course 1 (see catalogue 2006/07).
Academic content: One degree of freedom systems and modelling of continuous systems using generalised co-ordinates. Eigenfrequency-calculation of beams using the differential equation energy method. Calculation of forced response in time and frequency domain modal superposition. Response in ship-hill and motion of typical floating structures e.g. floaters, and tension leg platforms. Irregular waves and wave spectra, short-time and long-time statistics of waves. Transfer functions and response statistics. Separation of vortices. Vortex-induced vibrations. Anchor lines.
Teaching methods and activities: Lectures and exercises. If there is a re-sit examination, the examination form may change from written to oral.
Course materials: Lecture notes.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	70/100	C
MIDTERM EXAMINATION		30/100	C

TMR4190 Finite Element Methods in Structural Analysis

Lecturer: Professor Torgeir Moan
Weekly hours: Autumn: 3F+6Ø+3S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: Teach students to apply the theoretical foundations of the finite element method in modelling, analysis and interpreting the results, with applications to marine structures.

Recommended previous knowledge: Knowledge corresponding to TMR4105 Marine Technology 1, TMR4167 Marine Technology 2, TMR4247 Marine Technology 3, TMR4210 Marine Hydrodynamics and Structures BC 1 (see catalogue 2006/07) and TMR4170 Marine Structures BC.
Academic content: Energy principles for establishing stiffness relationships for beam - , plane stress - and plate bending problems. Global stiffness relationship achieved by element properties. Superelement and substructure techniques. Use of computer programs in finite element analysis. Examples of modelling of marine structures.
Teaching methods and activities: Lectures, exercises, including two mandatory computer exercises. The subject will be lectured in English every second year when international M.Sc. students take the subject. Portfolio assessment is the basis for the grade in the course. The portfolio includes a final written exam (70%) and exercises (30%). The results for the parts are given in %-scores, while the entire portfolio is assigned a letter grade. Postponed/repeated exams may be oral.
Course materials: K. Bell: Matrix Methods (in Norwegian), Tapir, 1994; or equivalent textbook.
T. Moan: Finite Element Modelling and Analysis of Marine Structures, Department of Marine Technology, NTNU, September 2003.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	70/100	C
MIDTERM EXAMINATION		30/100	C

TMR4195 Design of Offshore Structures

Lecturer: Professor Torgeir Moan
Weekly hours: Spring: 3F+6Ø+3S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: Provide the candidate with the knowledge and skills to carry out basic tasks regarding structural design and dimensioning of marine structures.
Recommended previous knowledge: Knowledge coresonding to TMR4105 Marine Technology 1, TMR4167 Marine Technology 2, TMR4247 Marine Technology 3, TMR4210 Marine Hydrodynamics and Structures BC 1 (see catalogue 2006/07) and TMR4170 Marine Structures BC.
Academic content: Serviceability and safety design criteria, including requirements to overall stability and strength as well as evacuation and escape. Overview of functional, environmental and accidental loads for marine structures, with an emphasis on wave-induced loads. Materials for marine structures. Limit state design checks. Alternative designs of facilities for the offshore oil and gas industry.
Teaching methods and activities: Lectures and exercises. This subject is taught in the international M.Sc.program every second year. Exercises and lectures are then conducted in English. Portfolio assessment is the basis for the grade in the course. The portfolio includes a final written exam (60%) and exercises (40%). The results for the parts are given in %-scores, while the entire portfolio is assigned a letter grade. Postponed/repeated exams may be oral.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	60/100	C
EXCERCISES		40/100	

TMR4200 Fatigue and Fracture of Marine Structures

Lecturer: Professor Stig Berge
Weekly hours: Autumn: 3F+6Ø+3S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises, project

Learning objectives: The students shall learn and understand theory and methods for design of ships, offshore structures and other types of marine structures against fatigue and fracture, methods for operation and maintenance of load-carrying structures.
Recommended previous knowledge: Basic materials technology and mechanics of solids.
Academic content: Linear-elastic and elastic-plastic fracture mechanics, materials characterisation, methods for defect assessment of structural components, failure analysis diagram. Cyclic loading and fatigue of metals, fracture mechanics analysis of fatigue, cumulative damage, stress corrosion cracking, corrosion fatigue, fatigue design methods. Materials for marine structures; steel, aluminium, titanium, composites, polymers. Strength properties with emphasis on fracture mechanics properties. The main focus is on applications for marine structures, but the methods are generally applicable for most types of dynamically loaded structures like bridges, cranes, pressure vessels, pipelines, aircraft, rotating machinery, etc.
Teaching methods and activities: Lectures, exercises, lab demonstrations and a project. 70% of the exercises and the project must be accepted for admission to the final exam. The course is part of an international MSc education and is taught in English when needed. Portfolio assessment is the basis for the grade in the course. The portfolio includes a final written exam (70%) and mid term exam (30%). The results for the parts are given in %-scores, while the entire portfolio is assigned a letter grade. Postponed/repeated exams may be oral.
Course materials: Compendia, lecture notes, exercises, laboratory demonstrations.

Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	70/100	C
MIDTERM EXAMINATION		30/100	C

TMR4205 Buckling and Collapse of Marine Structures in Steel and Aluminium

Lecturer: Professor Jørgen Amdahl
Weekly hours: Spring: 3F+6Ø+3S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises, Project work

Learning objectives: Obtain a fundamental understanding of the governing physical efects behind buckling and plastic collapse and acquire skills in the use of methods for analysis and practical design of marine strcures in steel and aluminium with respect to these failure modes.
Recommended previous knowledge: Courses TMR4167 Marine Technology 2 and TMR4210 Marine Hydrodynamics and Structures, Basic Course 1 (see catalogue 2006/07) or corresponding knowledge.
Academic content: Desig in the limit state of ultimate collapse, deign codes, guidelines (DnV; Norsok, Eurocode). Welding stresses in steel and aluminium structures. Effect of shape imperfections, welding stresses and soft zones on the resistance to buckling. Yield hinge theory and mechanism analysis of beams and frames. Incremetal plastic analysis. Interaction between bensding moment and axial force. Computer program for nonlinear analysis of frames and trussworks. Buckling of columns, beam-columns and franes. Buckling of plates in steel ansd lauminium subjected to uni-axial and multiple loads, including transvers pressure. Resistance of plate girders and box girders in post-buckling range. Buckling of stiffened shell strcutures.
Teaching methods and activities: Lectures and mandatory exercises. The subject is taught in the international M.Sc.program every second year. Exercises and lectures are then conducted in English. Portfolio assessment is the basis for the grade in the course. The portfolio includes a final written exam (85%)and exercises (15%). The results for the parts are given in %-scores, while the entire portfolio is assigned a letter grade. Postponed/repeated exams may be oral.
Course materials: Lecture notes, exrecise. Text book: Ultimate load analysis of marine structures, T. H. Søreide, Tapir publishers.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	85/100	C
EXCERCISES		15/100	

TMR4215 Sea Loads

Lecturer: Professor Odd Magnus Faltinsen
Weekly hours: Autumn: 3F+6Ø+3S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: To generate physical understanding and to make use of simple methods for an early design stage, for marine operation planning or for checking practical computer results or model experiments.
Recommended previous knowledge: Subject Marine hydrodynamics, BC or similar. Knowledge about dynamics and stochastic description of waves and loads
Academic content: It is shown how to calulate and minimize motions, accelerations and wave loads on semisubmersibles and ships. Mean and slowly varying motions of moored structures in waves, wind and current. Slamming.
Teaching methods and activities: Lectures and compulsory exercises. Portfolio assessment is the basis for the grade in the course. The portfolio includes a final written exam (75%) and exercises (25%). The results for the parts are given in %-scores, while the entire portfolio is assigned a letter grade. Postponed/repeated exams may be oral.
Course materials: O.M.Faltinsen: Sea Loads on Ships and Offshore Structures, Cambridge University Press, 1990.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	75/100	D
EXCERCISES		25/100	

TMR4217 Hydrodynamics for High-Speed Marine Vehicles

Lecturer: Professor Odd Magnus Faltinsen
Weekly hours: Spring: 3F+6Ø+3S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: Give physical understanding that makes it possible for students to interprete theoretical and experimental hydrodynamic investigations, that can be used i design of high-speed vessels.
Recommended previous knowledge: TMR4215 Sea Loads.

Academic content: The course considers the three main categories of high-speed vessels, i.e.hull-supported, air-cushion supported and foil supported vessels. Hull-supported vessels are divided into semi-displacement and planing vessels. All hydrodyanmic aspects are discussed. This means resistance, trim, wash, propulsion, seakeeping, hydrodynamic stability and maneuvering. Links to automatic control and structural mechanics are emphasized.
Teaching methods and activities: Lectures and exercises. Portfolio assessment is the basis for the grade in the course. The portfolio includes a final written exam (75%) and exercises (25%). The results for the parts are given in %-scores, while the entire portfolio is assigned a letter grade. Postponed/repeated exams may be oral.
Course materials: Faltinsen, O.M., 2005, Hydrodynamics of High-Speed Marine Vehicles, Cambridge University Press.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	75/100	D
EXCERCISES		25/100	

TMR4220 Naval Hydrodynamics

Lecturer: Professor Sverre Steen
Weekly hours: Spring: 3F+6Ø+3S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: To make the students familiar with procedures for calculations of resistance, propulsion and evalution of manoeuvring and steering ability of high speed craft and conventional ships. To make the students familiar with selection and design of proper hull form, propulsion and manoeuvring systems.
Recommended previous knowledge: TMR4247 Marine Technology 3 - Hydrodynamics or similar. General fluid mechanics. Basic knowledge of resistance and propulsion of ships.
Academic content: Application of lifting line and lifting surface theory in the design of propulsors, rudders, foils etc. Application of theory and experimental methods in calculation of resistance and in calculation of hydrodynamical characteristics of waterjets, tunnel thrusters and rotatable thrusters. Propeller induced vibration and noise. Influence of fouling, wind and waves on resistance and propulsion. Propulsor dynamics in waves. Horizontal stability and maneuverability characteristics of conventional ships.
Teaching methods and activities: Lectures and exercises. Portfolio assessment is the basis for the grade in the course. The portfolio includes a final exam (70%) and an oral mid term exam (30%). The results for the parts are given in %-scores, while the entire portfolio is assigned a letter grade. Postponed/repeated exams may be oral.
Course materials: Lecture notes.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	70/100	D
MIDTERM EXAMINATION		30/100	D

TMR4223 Marine Machinery

Lecturer: Førsteamanuensis Eilif Pedersen, Professor Maurice F. White
Coordinator: Førsteamanuensis Eilif Pedersen
Weekly hours: Autumn: 12S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises, Project- Laboratory work

Learning objectives: This course are aimed to deepen the knowledge and understanding of marine machinery systems design and analysis.
Recommended previous knowledge: Marine Technology 1-4.
Academic content: Introduction to machinery dynamics, vibration, vibration isolation and noise control. Auxillary systems for ships and platforms, system understanding, design, performance analysis, control and installation. Thermal engineering basics - energy management and system optimisation. Cooling, refrigereation, airconditioning and steam systems.
Teaching methods and activities: Lectures, exercises and project work. Postponed/repeated exams may be oral.
Course materials: To be stated at semester start.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	70/100	D
EXCERCISES		30/100	

TMR4225 Marine Operations

Lecturer: Professor II Tor Einar Berg, Professor II Finn Gunnar Nielsen
Coordinator: Professor II Finn Gunnar Nielsen
Weekly hours: Spring: 3F+6Ø+3S = 7.5 Cr
Time: Teaching time and location will be announced on the web.

Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: Provide insight in execution and modelling of marine operations. Enhance the understanding of which forces that are acting. Learn how to estimate forces, motions and regularity of marine operations in waves and current.
Recommended previous knowledge: Subjects Marine Structures, BC.
Academic content: Marine- and subsea operations related to installation and operation of offshore oil and gas fields are operations, oil recovery and regularity will be towing of structures. Further, issues related to design and operations of subsea vehicles are discussed. Main focus is on analysis of dynamic and hydrodynamic problems. Methods for estimating loads and responses in waves and current are discussed.
Teaching methods and activities: Lectures and exercises. Portfolio assessment is the basis for the grade in the course. The portfolio includes a final written exam (70%) and exercises (30%). The results for the parts are given in %-scores, while the entire portfolio is assigned a letter grade. Postponed/repeated exams may be oral.
Course materials: F.G. Nielsen: Lecture Notes. Marine Operations 2006 version.
T.E. Berg: Lecture Notes on Under Water Vehicles.
O.M. Faltinsen: Sea Loads on Ships and Offshore Structures, Cambridge University Press, 1990.
Handouts.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	70/100	C
EXCERCISES		30/100	

TMR4230 Oceanography

Lecturer: Professor Dag Myrhaug
Weekly hours: Spring: 3F+6Ø+3S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The emphasis will be on the physical understanding of phenomena contributing to the interaction between the atmosphere and ocean, and which also contribute to the motions in the ocean.
Recommended previous knowledge: Subject Marine hydrodynamics (see catalogue 2006/07).
Academic content: Properties of seawater. Conservation equations. Equations of motion. Coriolos effect. Geostrophic current. Inertial current. Planetary boundary layer flow. Wind-induced current. Bottom currents. Circulation. Tides. Global and local wind description. Mean wind. Wind gust. Wave forecast. Surface waves. Wave refraction. Non-linear waves. Breaking waves. Wave-current interaction.
Teaching methods and activities: Lectures and exercises. Portfolio assessment is the basis for the grade in the course. The portfolio includes a final oral exam (70%) and mid term exam (30%). The results for the parts are given in %-scores, while the entire portfolio is assigned a letter grade.
Course materials: Myrhaug, D: Lecture notes on Wind. Waves. Current.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	70/100	D
MIDTERM EXAMINATION		30/100	D

TMR4235 Stochastic Theory of Sealoads

Lecturer: Professor II Sverre Kristian Haver, Professor Dag Myrhaug
Coordinator: Professor Dag Myrhaug
Weekly hours: Autumn: 3F+6Ø+3S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The principles and methods which are used to describe stochastic processes will be explained. The emphasis will be on the applications to sealoads and motions of marine systems, and to make the students able to use such principles and methods.
Recommended previous knowledge: Basic knowledge in statistics on BSc/BEng-level corresponding to TMA4240/ TMA4245 Statistics, TMR4210 Marine Hydrodynamics and Structures, Basic Course (see catalogue 2006/07) and TMR4180 Marine Dynamics.
Academic content: Transformation of random variables. Monte Carlo simulation. Probability distributions for response. Parameter-estimation. Extreme-value statistics. Stochastic processes. Auto- and cross-correlation functions. Spectra and cross-spectra. Differentiation of stochastic processes. Excitation-response of stochastic processes. Equivalent linearization. Response-statistics.
Teaching methods and activities: Lectures and exercises. Portfolio assessment is the basis for the grade in the course. The portfolio includes a final written exam (70%) and mid term exam (30%). The results for the parts are given in %-scores, while the entire portfolio is assigned a letter grade. Postponed/repeated exams may be oral.

Course materials: D.E. Newland: An introduction to random vibrations, spectral and wavelet analysis, 3rd edition, 1993. D. Myrhaug: Lecture notes. B. Leira: Lecture notes.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	70/100	C
MIDTERM EXAMINATION		30/100	C

TMR4240 Marine Control Systems

Lecturer: Professor Asgeir Johan Sørensen
Weekly hours: Spring: 3F+6Ø+3S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Project works

Learning objectives: The course will give an introduction to design of control systems for dynamic positioning of ships and floaters, marine operations, marine automation and electrical power generation and distribution using maritime electrical installations on ships and floating marine structures.
Recommended previous knowledge: TTK4105 Control Systems or equals. It is recommended to study this course in parallel to TTK4190 Guidance and Control.
Academic content: The course focus on the design of control systems for various marine operations, motion control, positioning, manoeuvring, machinery systems and propulsion systems for ships and floating marine structures.
This includes dynamic positioning, thruster assisted position mooring, motion damping, crane control, machinery systems, propellers, thrusters, rudders, electrical power generation and distribution for maritime electrical installations. Application areas are shipping, offshore oil and gas, and aquaculture industries. Process knowledge including mathematical modelling is emphasized. Introduction to conventional linear monovariable (SISO) and multivariable (MIMO) control and observer designs (PID, LQG, Kalman filtering etc.) for marine applications will be given. Results from nonlinear state estimation and control, whereof passivity, feedback linearization, and Lyapunov analysis will be presented. It will also be given an overview of the implementation aspects with focus on signal processing. Aspects related to safety and performance of marine control systems, and authority and class requirements will be treated.
Teaching methods and activities: If needed, the lecture will be given on English. All written material is on English. Portfolio assessment is the basis for the grade in the course. The portfolio includes a final written exam (67%), and exercises (33%). The results for the parts are given in %-scores, while the entire portfolio is assigned a letter grade. Postponed/repeated exams may be oral.
Course materials: Lecture Notes: Marine Cybernetics: Modelling and Control, 5. ed. Department of Marine Technology.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	67/100	D
EXCERCISES		33/100	

TMR4253 Marine Systems Design

Lecturer: Amanuensis Bjørn Oskar Sillerud
Weekly hours: Autumn: 12S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The subject will give the students an introduction to preliminary design of displacement vessels. The students should also be able address the wider aspects of design such as mission analysis, requirements specification, concept development and evalutation.
Recommended previous knowledge: Subjects Marine technology 1, 2 and 3. Basic knowledge in marine technology.
Academic content: Outline of the design process for displacement vessels: Main dimensions, weight, volumes, and cost on the basis of specified capacity and speed. Definition section area curve, lines sketch, subdivision, and control of stability, freeboard and floodable length. Application computer programs in design and analysis.
The aspects of the design process in greater depth: Problem solving, creativity, optimality and decision under uncertainty. Design based on systems analysis methods. These design aspects are demonstrated in design of a semi-submersible platform.
Teaching methods and activities: Lectures, exercises and project assignments. Understanding and ability to perform realistic marine systems design projects. Postponed/repeated exams may be oral.
Course materials: K. Levander: System Based Ship Design.
Stian Erichsen: Elements and Techniques of Marine Design.
Selected lecture notes and papers.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	50/100	D
MIDTERM EXAMINATION		20/100	D
EXCERCISES		30/100	

TMR4265 Operation Technology, Basic Course

Lecturer: Førsteamanuensis II Trond Michael Andersen, Professor Svein Kristiansen, Professor Magnus Rasmussen, Førsteamanuensis II Tom Anders Thorstensen
Coordinator: Professor Magnus Rasmussen
Weekly hours: Spring: 12S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises and Project work

Learning objectives: This course will give the students basic knowledge and understanding of operation of marine systems, and factors influencing efficiency, safety, the environment and cost during the operation phase. Further, the course will give the students basic knowledge of strategies, systems and requierments for control and management of these factors.
Recommended previous knowledge: TMR4105 Marine Technology 1, TMR4167 Marine Technology 2, TMR4247 Marine Technology 3, and TMR4110 Marine Design and Marine Engineering, Basic Course (see catalogue 2006/07), or equivalent knowledge compared to these mentioned courses.
Academic content: rief description of organisations and systems for the operation phase. Type of failure in equipment and machinery during operation, and the failure causes. The influence of these failures on efficiency, safety and the environment. Condition monitoring and inspection methods. The maintenance function. Condition-based maintenance. The RCM-consept and the statistical and probability teory base for this consept. Introduction to risk- and safety management and analysing methods.
Teaching methods and activities: Lectures, a laboratory ecercise and conventional exercises. Mandatory project work. The laboratory exercise is also mandatory. 75% of the exercises are requiered for admission to the final exam. The project work count 30% on the course grade. A midterm exam count 20% and the final exam 50%. Postponed/repeated exams may be oral.
Course materials: Lecture notes and handouts distributed at lectures and exercises.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	50/100	A
MIDTERM EXAMINATION		20/100	A
EXCERCISES		30/100	

TMR4275 Modelling, Simulation and Analysis of Dynamic Systems

Lecturer: Førsteamanuensis Eilif Pedersen
Weekly hours: Autumn: 3F+6Ø+3S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: Make the student able to develop mathematical models for simulation and analysis of physical dynamic systems. Practice use of modelling and simulations software for solving problems.
Recommended previous knowledge: Marine Technology 1-4 or similar.
Academic content: This course gives an introduction to physical principles and laws that are used to describe the behaviour of physical systems and introduces methods for development of mathematical models for such systems. An energy based approaches to modelling of such systems are introduced using a graphical systematic and unified method used as both an representation and as a methodology for development of consistent proper mathematical models. From a set of generalised variables a set of basic elements are developed and used for modelling of mechanical, electric, hydraulic, thermal and composite systems. Introduction to numerical methods for solution of mathematical models in state space form, system analysis and numerical simulation are given. A broad selection of engineering systems will be selected for modelling and simulation.
Teaching methods and activities: Lectures, exercises, computer exercises and project work. All lectures will be in English. Portfolio assessment is the basis for the grade in the course. The portfolio includes a final written exam (70%) and exercises (30%). The results for the parts are given in %-scores, while the entire portfolio is assigned a letter grade. Postponed/repeated exams may be oral.
Course materials: Pedersen, E., Engja, H., Mathematical Modelling and Simulation of Physical Systems, Lecture Notes, 2003.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	70/100	D
EXCERCISES		30/100	

TMR4280 Internal Combustion Engines

Lecturer: Professor Harald Valland
Weekly hours: Spring: 3F+6Ø+3S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The course will give the students basic introduction to internal combustion engines with emphasis on general features, power, energy utilization, mechanical and thermal loads, and exhaust emissions

Recommended previous knowledge: TEP4120 Thermodynamics 1 or similar.
Academic content: Overview of different types of internal combustion engines (ICE). Piston engine construction and features. Introduction to the working cycle of ICE with emphassi on factors that influence engine performance.
Gas exchange process and increasing engine power by means of turbocharging. Engine fuels. Methods for fuel supply, ignition and combustion. Exhaust emissions, mechanisms for formation of pollutants, amounts of emissions. Dynamic forces in the runniong gear. Mechanical and thermal loads. Engine monitoring and control.
Teaching methods and activities: Lectures, exercises, project work, and laboratory exercises. The subject is included in the MSc programme for foreign students. Lecturing in English language, jointly for IVT and MSC students if selected. Portfolio assessment is the basis for the grade in the course. The portfolio includes a final written exam (50%), mid term exam (25%) and exercises (25%). The results for the parts are given in %-scores, while the entire portfolio is assigned a letter grade. Postponed/ repeated exams may be oral.
Course materials: Specified at start of semester.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	50/100	D
EXCERCISES		25/100	
MIDTERM EXAMINATION		25/100	C

TMR4290 Diesel-Electric Propulsion Systems

Lecturer: Professor Lars Einar Norum
Coordinator: Professor Harald Valland
Weekly hours: Autumn: 3F+6Ø+3S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: Give the students an introduction to electrical engineering of importance for design and analysis of electrical systems on ships and platforms.The course should give the students an introduction to electrical power engineering which is important for management and coordination of design and analysis of electrical systems on ships and platforms.
Recommended previous knowledge: TFY4102 Physics and TMR4310 Marine Technology 4 - Machinery.
Academic content: Modul 1: Introduction to electrical engineering: Characteristics of electrical systems, power generation, distribution and voltage levels on maritime systems, moment and power characteristics of electrical motors etc. Modul 2: Electrical propulsion systems: Criteria for system design and optimal dimensioning of system and components, optimal operation. Introduction to basic methods for technical and economical analysis and evaluation of electrical systems. Safety requirements.
Teaching methods and activities: Lecture, exercises (calculation and data exercises) and mid-term test. Portfolio assessment is the basis for the grade in the course. The portfolio includes a final written exam (70%) and mid-term test (30%). The results for the parts are given in %-scores, while the entire portfolio is assigned a letter grade. Postponed/repeated exams may be oral.
Course materials: Lecture notes.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	70/100	A
MIDTERM EXAMINATION		30/100	A

TMR4295 Design of Mechanical Systems

Lecturer: Stipendiat Jon Olav Holan, Professor Bernt Johan Leira, Professor Maurice F. White
Coordinator: Professor Maurice F. White
Weekly hours: Autumn: 3F+6Ø+3S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: Introduction into design, function, layout and dimensioning of mechanical systems, with emphasis on component design and system function based on the interpretation and understanding of engineering drawings.
Recommended previous knowledge: All compulsory courses for the specialisation Marine Systems up to and including the 6th term.
Academic content: Basic technical drawing, understanding of outlines, cross-sections, projection, dimensions and tolerances. Use of computer aided design (CAD) for making detailed drawings of engineering components and system assembly plans. Introduction to machine design, in particular: rotating shafts (also dynamically loaded), dimensioning against fatigue, pressed joints, interference fits, gears, bearings, couplings, seals, and shaft loads.
Introduction into the use of finite element methods (FEM) for analysis of components with mechanical and thermal loading. Basic elements, system matrices, boundary conditions, calculation of stress, solutions, convergence, accuracy, heat transfer, temperature stress, evaluation or results.

Teaching methods and activities: Lectures, tutorials and exercises. Compulsory exercises where 2/3 must be approved before taking the final exam. One project that counts 30% of the final grade, covering CAD and machine design. Postponed/repeated exams may be oral.
Course materials: Textbooks and lecture notes.
Assessment: Written examination/Work

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	70/100	C
EXCERCISES		30/100	

TMR4300 Experimental and Numerical Hydrodynamics

Lecturer: Professor Bjørnar Pettersen, Professor Sverre Steen
Coordinator: Professor Sverre Steen
Weekly hours: Autumn: 4F+4Ø+4S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: Learn to apply lab experiments and numerical calculations as tools for investigation of hydrodynamic properties of ships and ocean structures. Get an overview of the most frequently applied measurement techniques, modelling techniques, and types of model tests. Introduction to numerical hydrodynamics. Introduction to uncertainty analysis of experiments and challenges related to mathematical and numerical modelling. The topic shall give in-depth knowledge of problems of importance in marine hydrodynamics.
Recommended previous knowledge: TMR4247 Marine Technology 3 - Hydrodynamics, TMR4215 Sea Loads, TMR4220 Naval Hydrodynamics, TMR4160 Computer Methods for Marine Technology Applications or equivalent.
Academic content: Basic instrumentation and measurement principles, measurement using strain gauges, equipment and methods for data acquisition. Introduction to advanced measurement techniques, like Particle Image Velocimetry. Calibration of measurement sensors. Techniques for construction of models. Typical model tests and techniques, including ship resistance, propulsion, propeller open water test, cavitation tests, seakeeping, experiments with slender structures. CFD software for potential flow (panel methods) and viscous flow (Navier-Stokes), grid generation methods and visualisation. In some cases, numerical and experimental results will be compared. Uncertainty analysis. Error sources in experiments and calculations. Special considerations about full scale measurements.
Teaching methods and activities: Lectures and mandatory lab exercises, which are performed in groups. Grades given based on the delivered lab exercise reports.
Course materials: Lecture notes and scientific papers.
Assessment: Work

Forms of assessment	Date/Time	Percentage	Exam. support
EXCERCISES		100/100	

TMR4305 Advanced Analysis of Marine Structures

Lecturer: Professor Carl Martin Larsen, Professor Torgeir Moan
Coordinator: Professor Torgeir Moan
Weekly hours: Autumn: 4F+6Ø+2S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: Strengthen the understanding of the finite element method as applied for non-linear and dynamic analysis of the marine structure.
Recommended previous knowledge: TMR 4167 Marine technology 2 - Structures, TMR 4180 Marine dynamics, TMR 4190 Finite element method in structural analysis, TMR4195 Design of offshore structures.
Academic content: The course is lectured in two paralell modules that deal with static and dynamic analysis respectively. Static analysis: Fundamental theory for plate and shell elements. Modelling of marine structures, Introduction to non-linear analysis of structures with large displacements and plasticity. Errors from discretization and numerical processing. Quality control of computations. Dynamic analysis: Formulation of dynamic equilibrium by use of finite elements. Eigenvalue analysis. Reduction of number of degrees of freedom in dynamic analysis. Mode superposition. Calculation og forced vibrations in frequency and time domain. Damping models. Selected topics related to dynamics of offshore structures.
Teaching methods and activities: Lectures and exercises. Selected exercises might be mandatoory. Matlab and finite element programs will be used in the exercises. The course will be lectured in English if needed. The exam might be held as an oral exam if number of students is low.
Course materials: Moan: An introduction to the finite element method.
Langen and Sigbjørnsson: Dynamic analysis of structures (Unofficlal English translation).
Both lecture notes can be purchased at the department. Some additional notes might be distributed during the lechtures.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TMR4500 Marine Structures, Specialization Project

Lecturer: Professor Jørgen Amdahl, Professor Stig Berge, Professor Carl Martin Larsen, Professor Bernt Johan Leira, Professor Torgeir Moan
Coordinator: Professor Torgeir Moan
Weekly hours: Autumn: 12S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The student shall develop the ability to get familiar with a specific topic within the chosen area of specialization by use of scientific methods. This includes collecting information and gaining insight by studies of relevant literature and other sources of information and combining this information with his own knowledge. Moreover, the student shall be trained in carrying out an extensive project, by developing a project plan with milestones, reporting intermediate results of his work and completing a project report according to recognised standards.
Recommended previous knowledge: All mandatory subjects in the 3rd and 4th year for the study of Marine Structures and the relevant specialisation.
Academic content: The topic for the project thesis and the chosen combination of subjects in TMR4505, should be consistent. The supervisor of the project thesis should approve the choice of subjects.
Teaching methods and activities: Individual project work under supervision.
Course materials: To be agreed with the supervisor.
Assessment: Work

Forms of assessment	Date/Time	Percentage	Exam. support
EXCERCISES		100/100	

TMR4505 Marine Structures, Specialization Course

Lecturer: Professor Jørgen Amdahl, Professor Stig Berge, Professor Carl Martin Larsen, Professor Bernt Johan Leira, Professor Torgeir Moan
Coordinator: Professor Torgeir Moan
Weekly hours: Autumn: 4F+4Ø+4S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: This subject aims at giving in-depth knowledge of problems relevant for marine structural engineering.
Recommended previous knowledge: All mandatory subjects in the 3rd and 4th year for the study of Marine Structures and the relevant specialisation.
Academic content: Two topics of 3,75 ECTS each shall be selected. The most relevant topics for this in-depth study (FDE) are: Dynamic analysis of marine structures (3,75 ECTS), Analysis of marine structures, advanced course (3,75 ECTS), Material technology and fracture mechanics (3,75 ECTS), Hydroelasticity (3,75 ECTS), Experimental methods in marine hydrodynamics (3,75 ECTS), Numerical methods in marine hydrodynamics (3,75 ECTS), Data-based modelling and control of marine systems (3,75 ECTS), Ice-1 (3,75 ECTS), Ice-1 (3,75 ECTS), Underwater technology (3,75 ECTS), The choice of topic depends upon the selected specialisation and is to be approved by the project thesis supervisor (or the faculty in charge).
Teaching methods and activities: The topics are presented by lectures, possibly accompanied by exercises, seminars or self studies. The exam is to be held within the exam period, also when the initial exam is delayed.
Course materials: To be specified by the faculty in charge of each topic (module of 3,75 ECTS).
Assessment: Oral examination

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	100/100	D

TMR4520 Marine Hydrodynamics, Specialization Project

Lecturer: Professor II Tor Einar Berg, Professor Odd Magnus Faltinsen, Førsteamanuensis Håvard Holm, Professor II Finn Gunnar Nielsen, Professor Bjørnar Pettersen, Professor Sverre Steen, Professor II Rong Zhao
Coordinator: Professor Sverre Steen
Weekly hours: Autumn: 12S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The student shall learn to immerse one self in a specific topic within marine hydrodynamics, using a scientific method of work. This includes to obtain additional knowledge through searching scientific literature and other relevant sources, and to combine this with own knowledge. The student shall learn to perform a larger, independent project, including making a project plan and project report in accordance with generally recognized standards. The master thesis might be a continuation of the project thesis.
Recommended previous knowledge: All mandatory subjects in 3rd and 4th year for the study programme and specialisation.
Academic content: Topic for the project thesis shall be compatible with the selected topics for TMR4520. The supervisor for the project thesis shall approve choice of topics for the supplementary topic and the in-depth topic (TMR4525).

Teaching methods and activities: Individual project work with guidance from supervisor.
Course materials: To be announced at the beginning of the semester.
Assessment: Work

Forms of assessment	Date/Time	Percentage	Exam. support
EXCERCISES		100/100	

TMR4525 Marine Hydrodynamics, Specialization Course

Lecturer: Professor Sverre Steen
Weekly hours: Autumn: 4F+4Ø+4S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments:

Learning objectives: The subject shall give in-depth knowledge of important problems in hydrodynamics.
Recommended previous knowledge: All mandatory subjects in 3rd and 4th year for the study programme and specialisation.
Academic content: Two topics of 3.75 ECTS each shall be selected. The most relevant for this specialisation is Experimental methods in marine hydrodynamics (3.75 ECTS), Numerical methods in marine hydrodynamics (3.75 ECTS), Hydroelasticity (3.75 ECTS), Dynamic response of marine structures (3.75 ECTS), Analysis of marine structures, advanced course (3.75 ECTS), Ice 1 (3.75 ECTS), Ice 2 (3.75 ECTS). Choice of topics depends on the selected specialisation and shall be approved by your supervisor for your project thesis (ref. TMR4520).
Teaching methods and activities: The topics are lectured. In some topics, lectures are supplemented with exercises, seminars or self-tuition. The score is given based on portfolio assessment. In the portfolio is included oral examination, and/or submitted reports, depending on which topics are selected. Resit examination is held within the same exam period.
Course materials: To be announced at the beginning of the semester.
Assessment: Oral examination

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	100/100	D

TMR4530 Marine Engineering, Specialization Project

Lecturer: Amanuensis Tore Hansen, Førsteamanuensis Eilif Pedersen, Professor Harald Valland, Professor Maurice F. White
Coordinator: Professor Harald Valland
Weekly hours: Autumn: 12S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The student shall learn to immerse oneself in a specific topic within the chosen specialization, using a scientific method of work. This includes to obtain additional knowledge through searching scientific literature and other relevant sources, and to combine this with own knowledge. The student shall learn to perform a larger, independent project, including making a project plan with breakpoints, reporting part results and write a project report in accordance with generally recognized standards.
Recommended previous knowledge: All mandatory subjects in 3rd and 4th year for the specialization “Marine Machinery”.
Academic content: Topic for the project shall be central for the specialization “Marine Machinery” and related to marine activities.
Teaching methods and activities: Individual project work with guidance from supervisor.
Course materials: To be announced at the beginning of the semester.
Assessment: Work

Forms of assessment	Date/Time	Percentage	Exam. support
EXCERCISES		100/100	

TMR4535 Marine Engineering, Specialization Course

Lecturer: Professor Harald Valland
Weekly hours: Autumn: 4F+6Ø+2S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Project work

Learning objectives: The subject shall give in-depth knowledge of important problems related to the specialization “Marine Machinery”.
Recommended previous knowledge: TMR4247 Marine technology 3, TMR4222 Marine Machinery, and TMR4280 Internal Combustion Engines, or similar courses.
Academic content: Two topics of 3.75 ECTS shall be selected among the following three topics: TMR9 Internal Combustion Engines, TMR21 Marine Mechatronics, and TMR5 Operation Technology, Maintenance.
Teaching methods and activities: The topics are given as lectures, exercises, project work, and self-tuition. The score is given based on portfolio assessment. In the portfolio is included oral examination 80 %, and submitted reports 20 %. Results from the

parts are given as %-points, whereas evaluation of the complete portfolio (final grade) is given by letter grade. Repetition of the oral examination is held within the same exam period.
Course materials: Compendium, lecture notes, and exercise texts.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	80/100	D
EXCERCISES		20/100	

TMR4550 Operation Technology, Specialization Project

Lecturer: Professor Magnus Rasmussen
Weekly hours: Autumn: 12S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Project

Learning objectives: The student shall learn to immerse one self in a specific topic within operation technology, using scientific methods of work. This includes to obtain additional knowledge through searching scientific literature and other relevant sources, and to combine this with own knowledge. The student shall learn to perform a larger, independent project work, including making a project plan and project report in accordance with generally recognized standards. The master thesis is most often a continuation of the project thesis.
Recommended previous knowledge: All mandatory subjects in 3rd and 4th year for the study program and the specialization "Operation Technology".
Academic content: Topic for the project thesis has to be related to marine activity, and focusing on problems within the area of "Operation Technology".
Teaching methods and activities: Individual project work with guidance from the supervisor.
Course materials: None.
Assessment: Work

Forms of assessment	Date/Time	Percentage	Exam. support
EXCERCISES		100/100	

TMR4555 Operation Technology, Specialization Course

Lecturer: Professor Magnus Rasmussen
Weekly hours: Autumn: 4F+6Ø+2S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Project work

Learning objectives: The subject shall give in-depth knowledge of important problems related to Operation Technology within Marine Activities.
Recommended previous knowledge: TMR4260/4265 Operation Technology, Basic Course or equivalent.
Academic content: Two courses, each 3.75 ECTS, have to be selected. The course "Operation Technology, Maintenance" is mandatory. The other course has to be selected among the two courses "Logistic Engineering and Management for Marine Operations" or "Combustion Engines".
Teaching methods and activities: Temaene gis som forelesninger, øvingsoppgaver, prosjektarbeider og selvstudier. Mappeevaluering gir grunnlag for sluttkarakteren i emnet. I mappen inngår muntlig avsluttende eksamen 80% og arbeider 20%. Resultatet for delene angis i %-poeng. Vurdering for hele mappen (sluttkarakteren) angis med bokstavkarakter. Utsatt eksamen avholdes innen utgangen av eksamensperioden.
Course materials: Lecture notes.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	80/100	D
EXCERCISES		20/100	

TMR4560 Marine Systems Design, Specialization Project

Lecturer: Professor Svein Kristiansen
Weekly hours: Autumn: 12S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: Training in in-depth study of a specific topic based on scientific methods which involves litterature study, data search in combination with own knowledge. Undertake a project that involves problem definition, work planning, analysis and reporting in accordance with required guidelines.
Recommended previous knowledge: All mandatory subjects in 3. and 4. year for the "Marin systems design" specialization.
Academic content: The topic of the project assignment shall be within the main profile which is design of ships, floting units, fishing vessels or underwater vehicles. The topic may also be related to the development of design methods and software.

Teaching methods and activities: Project assignment under supervision by instructor.
Course materials: To be announced.
Assessment: Work

Forms of assessment	Date/Time	Percentage	Exam. support
EXCERCISES		100/100	

TMR4565 Marin Systems Design, Specialization Course

Lecturer: Professor Svein Kristiansen
Weekly hours: Autumn: 4F+6Ø+2S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The course shall give in-depth knowledge within marine systems design.
Recommended previous knowledge: All mandatory topics in 3. and 4. year for the specialization "Marine systems design".
Academic content: The course consists of two topics each 3,75 stp. Elective topics are:
Advanced CAD- and PDM- systems for ship design;
Decision support in marine safety;
Logistics of marine units and operations;
Fleet management and supply chains;
Equipment and techniques in fishing and fish farming;
Underwater technology.
Teaching methods and activities: The topics are teached by lectures, exercises and small project assignments. Portefolio assessment weighted as follows: Exam 80 % and work 20 %. Each topic is graded in per cent whereas the consolidated grade is given by letter (ECTS). Postponed exam is held within the end of the exam period.
Course materials: Selcted readings, lecture notes and assignments.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	80/100	D
EXCERCISES		20/100	

TMR5230 Nautical Science, Basic Course

Lecturer: Professor Egil Pedersen
Weekly hours: Autumn: 3F+6Ø+3S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: To provide a basic knowledge in maritime technology with emphasis on navigational safety at sea, operational efficiency of nautical operations and the importance of a link between developers and end-users of nautical systems.
Recommended previous knowledge: None.
Academic content: Collision and grounding avoidance at sea: ARPA, AIS, ECDIS/ECS systems, derivation of DCPA and TCPA, speed-aspect ratio, UKC management. Shipboard weather routing: Isochrone method for stochastic/deterministic minimum time/fuel routing; formulation of optimization problem, methods for solving, algorithms. Astronomic navigation: Formulation and solution of the celestial positioning problem without dead reckoning nor GMT. Environmental Stress (ES) model for evaluation of ship-handling difficulties in congested and topographically restricted waterways: Principle, subjective stress values, applications. Cable mechanics with nautical applications: Inelastic cable line equations, single and spread mooring systems, case studies. Quality control in marine navigation.
Teaching methods and activities: Lectures and compulsory exercises. Case studies. A project exercise will count 30 % in the grading.
Course materials: Compendium, lecture notes, technical/scientific papers.
Assessment: Oral examination/Work

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	70/100	D
EXCERCISES		30/100	

TMR5240 Nautical Science, Advanced Course

Lecturer: Professor Egil Pedersen
Weekly hours: Autumn: 3F+6Ø+3S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: Utilize approximations and simplified methods for critical assessment of navigational safety at sea and evaluation of operational efficiency of nautical operations.
Recommended previous knowledge: TMR5230 Nautical Science, Basic Course.

Academic content: Errors in ARPA system: Modelling and analysis of the plotting performance due to errors in the pointing targets. Collision avoidance functionality on Electronic Chart System: Formulation of collision problem, exact collision danger regions in true motion display, simulator experiments. Advanced shipboard weather routing. Operational aspects in marine seismic surveying: Principles, survey methods, interaction effects in multi-cable towing systems, case studies. Ship-ship interaction in lightering and replenishment operations at sea. Advanced position and quality control methods in offshore operations.
Teaching methods and activities: Lectures and compulsory exercises. Case studies. A project exercise will count 30 % in the grading.
Course materials: Compendium, lecture notes, technical/scientific papers.
Assessment: Oral examination/Work

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	70/100	D
EXCERCISES		30/100	

TMR5250 Nautical Science, Project

Lecturer: Professor Egil Pedersen
Weekly hours: Autumn: 12Ø = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: Introductory and preparatory studies for thesis work within the field of maritime technology.
Recommended previous knowledge: Various subjects within the field of maritime technology, dependent on the topic of the thesis.
Academic content: Studying necessary literature references and working out a plan of progress for the project work.
Teaching methods and activities: Supervised project.
Course materials: Not decided.
Assessment: Work

Forms of assessment	Date/Time	Percentage	Exam. support
EXCERCISES		100/100	

TMR5260 Nautical Science, Spesialization Course

Lecturer: Professor Egil Pedersen
Weekly hours: Autumn: 2F+8Ø+2S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: Supporting topics within the topic of the thesis work.
Recommended previous knowledge: Compulsory subjects in the MSc Programme in Nautical Science.
Academic content: Two topics selected from a list presented for the students in connection with the thesis work.
Teaching methods and activities: Lectures and voluntary exercises.
Course materials: Lecture notes, technical/scientific papers.
Assessment: Oral examination

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	100/100	D

Department of Materials Technology

TMT4150 Refractories

Lecturer: Førsteamanuensis Kjell Wiik
Weekly hours: Spring: 4F+2Ø+6S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Project work

Learning objectives: Establish a basic tool for the choice of refractory materials for a given process.
Recommended previous knowledge: Knowledge of chemical thermodynamics and phase diagrams are an advantage.
Academic content: Methods for manufacturing refractory bricks, refractory masses and carbon based materials. Thermal, and thermomechanical properties. Structure, chemical composition and mineral composition for the most common and important refractory materials. Thermal-insulating refractories. Chemical attack on refractory materials. Thermal shock resistance.
Teaching methods and activities: Lectures and written exercises. Final grade in the course is based on portfolio assessment. The portfolio includes written final examination (75%) and a project work (25%). The project work will be combined with an excursion. The evaluation of the different parts is given in %points while the final grade for the whole folder is given by a letter

grade. Lectures are given in English if there are students from the International master courses in Light metal production. For authum examination written final examination can be replaced with oral examination.
Course materials: "Refractories Handbook", Published by The Technical Association of Refractories, Japan, (June 1998). Various articles and exercises.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	75/100	C
EXCERCISES		25/100	

TMT4155 Heterogeneous Equilibria and Phase Diagrams

Lecturer: Professor Tor Grande
Weekly hours: Autumn: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The subject aims to give the students knowledge in chemical thermodynamics applied on heterogeneous phase equilibria including the effect of surfaces and interfaces. Application of phase diagrams in materials science and engineering will be in focus, and the calculation of phase diagrams from thermodynamic data and solution models are also included.
Recommended previous knowledge: Knowledge equivalent to TMT4275, Thermodynamics and Phasediagrams, TKJ4160, Physical Chemistry or Chapters 1-7 in Gaskell, D. R: 'Introduction to the Themodynamics of Materials', 4. edition, Taylor Francis (2003).
Academic content: Short repetition of the 1., 2., and 3. law of thermodynamics. Phase transitions. The thermodynamics of solutions with emphasis on inorganic and metallic systems. Gibbs Phase law applied on liquid/solid, gas/solid and solid/solid phase equilibria. Phase diagrams for 1, 2, 3 and multi component systems with emphasis on systems of relevance for important metallurgical systems and inorganic materials. Phase stability and thermodynamics of surfaces and interfaces. Demonstration of commercial thermodynamic computer programs.
Teaching methods and activities: Lectures including written exercises will be given. Lectures are given in English. Final grade in the course is based on portfolio assessment. The portfolio includes written final examination (76%) as well as two semester tests counting 12% each. The evaluation of the different parts is given in %points while the final grade for the whole folder is given by a letter grade. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: Svein Stølen and Tor Grande, Thermodynamics of Materials, John Wiley sons, Ltd (2004). Lecture notes and exercises.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	76/100	C
MIDTERM EXAMINATION		12/100	C
MIDTERM EXAMINATION		12/100	C

TMT4165 Materials- and Electro Chemistry, Project Work

Lecturer: Førsteamanuensis Kjell Wiik
Weekly hours: Spring: 2F+6Ø+4S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Pass/Fail Compulsory assignments: None

Learning objectives: The objective is to give the students a wide introduction to the experimental techniques, relevant both to electro- and materials chemistry.
Recommended previous knowledge: None.
Academic content: Laboratory furnaces, measurement and control of temperature. Vacuum techniques and work in inert atmosphere. Working techniques in electro- and inorganic chemistry. Synthesis of inorganic materials. Demonstration of several measuring- and analysis methods, both theoretical and practical. Thermal analysis, X-ray diffraction, electron microscopy and optical microscopy, microanalysis and FTIR spectroscopy. Voltametry, current step,reference electrodes, potentiostat, impedance analysis and transient methods.
Teaching methods and activities: Exercises, demonstrations and written project work. The students are guided through a number of experimental methods and techniques, essential for the reasearch activites at the department. A 7-weeks assignment will be carried out by the students and presented the end of the semester. Lectures are given in English on demand.
Course materials: Compendium.
Assessment: Work

Forms of assessment	Date/Time	Percentage	Exam. support
EXCERCISES		100/100	

TMT4185 Materials Science and Engineering

Lecturer: Professor Lars Arnberg, Professor Jarle Hjelen
Coordinator: Professor Jarle Hjelen
Weekly hours: Autumn: 4F+2Ø+6S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Excercises

Learning objectives: The main objective with this subject is to give a short introduction of the behaviour of various types of materials (metals, ceramics, polymers)and to discuss this in terms of their fundamental physical/chemical properties. Mechanical strength, toughness and corrosion are some key issues.
Recommended previous knowledge: None.
Academic content: Structures, defects and dislocations in solids. Transport properties (diffusion), mechanical properties (elasticity, deformation, strength), phase equilibria (phase diagrams), phase transformations, electrical properties. Basic principles of corrosion are discussed. Various materials are discussed, like iron/iron alloys, ceramics, polymers and composites.
Teaching methods and activities: Lectures and compulsory exercises.Lectures are given in English if there are students from the International master courses in Light metals production. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: William D. Callister Jr.: Materials Science and Engineering, An Introduction, 7. ed., John Wiley og Sons Inc, 2006.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TMT4220 Mechanical Properties of Engineering Materials 1

Lecturer: Førsteamanuensis Bjørn Holmedal
Coordinator: Professor Erik Aasmund Nes
Weekly hours: Autumn: 4F+1Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Excercises

Learning objectives: The subject aims to give an introduction to the basic strengthening mechanisms of industrial important materials, emphasizing metals and polymers.
Recommended previous knowledge: TMT4170 Materials Technology 1 and TMT4175 Materials Technology 2, alternatively TMM4100 Materials Technology 1 or TMM4140 Materials Technology 2.
Academic content: The subject starts with a review of experimental techniques for characterisation of mechanical properties, where the main focus is on the simple tensile test. Next the basic mechanisms of flow phenomena and deformation hardening in metallic materials and polymers are treated. Based on simple dislocation models the relations between microstructure and mechanical properties of metals are considered. For the case of polymers the basic mechanical models for visco-plasticity and rubber-plasticity are related to various microstructures.
Teaching methods and activities: Lectures and exercises. At delayed exams (continuation exam) the written examination may be replaced by an oral examination
Course materials: G.E. Dieter: Mechanical Metallurgy. Additional printed notes and the lectures (notes).
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TMT4295 Electrolytic Processes

Lecturer: Professor Geir Martin Haarberg
Weekly hours: Autumn: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The contents of the course should give a basic understanding of the industrial electrolyses processes in Norway.
Recommended previous knowledge: TMT4250 Electrochemistry, Basic Course or equivalent knowledge.
Academic content: Basic theory and background for industrial electrolysis; including heat balance, cell design, electrode reactions, overvoltage and electrode materials. Comprehensive treatment of molten salts as electrolytes, including emf cells and metal solubility. Special treatment of industrial processes of importance for Norway;
- chlor-alkali and chlorate.
- zinc.
- nickel, copper, cobalt.
- electroplating.

- aluminium and magnesium.
- refining of aluminium.

Teaching methods and activities: Lectures and problem solving. Lectures are given in English if there are students from the International master courses in Light metal production. If there is a re-sit examination, the examination form may be changed from written to oral.

Course materials: Lecture notes.

Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TMT4325 Refining and Recycling of Metals

Lecturer: Professor Lifeng Zhang
Weekly hours: Autumn: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Excerises

Learning objectives: To provide a theortical fundamentals and techniques in the field of refining. To bridge extractive metallurgy and casting. To connect mechanical properties, qualities to the refining and recycling of metals. To emphasize the recycling of metals.

Recommended previous knowledge: Basic chemistry and mathematics.

Academic content: The subject gives an overview of the origin of inclusions and impurities elements in metals. An introduction to basic thermodynamics and kinetics for the refining and recycling of metals is presented. State of art in the refining and recycling (remelting) of aluminium, silicon, magnesium and steel are treated. Fundamentals of Transport Phenomena during refining and recycling of metals. Fluid flow related phenomena during refining and recycling of metals.

Teaching methods and activities: Lectures, exercises and projects. Water modell and hot metal experiments. Final grade in the course is based on portfolio assessment. The portfolio includes written final examination (50%), one semester test counting 30% and projects counting 20%. The evaluation of the different parts is given in %points while the final grade for the whole folder is given by a letter grade. The course is held in English. For authum examination written final examination can be replaced with oral examination.

Course materials: Engh, T. A., "Principles of Metal Refining", Oxford University Press, 1992. R. Byron Bird, Warren E. Stewart, Edwin N. Lightfoot, "Transport Phenomena", Second Edition, ISBN:0471410772.

Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	50/100	B
MIDTERM EXAMINATION		30/100	B
EXCERCISES		20/100	

TMT5100 Electrolysis of Light Metals 2

Lecturer: Professor II Knut Arne Paulsen
Coordinator: Professor Trygve Foosnæs
Weekly hours: Spring: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: Basic understanding of the principles for aluminium production and their industrial application.

Recommended previous knowledge: It will be a advantageous to have knowledge corresponding to the course TMT4295 Electrolytic processes. The course is a continuation of this, with emphasis on the industrial application in the electrolysis process.

Academic content: The course is given every year. The gives an introduction to the practical application of the theory of light metals production, with emphasis on aluminium electrolysis. The main topics are: Energy balance and thermochemistry, bath chemistry, additives and physico-chemical properties of bath, alumina, its properties, solubility in the bath, and alumina feeding, current efficiency and energy consumption, magnetic fields,operation of industrial cells, process control, practical improvements of the process in the past, present and in the future.

Teaching methods and activities: Voluntary exercises. Postponed exams may be oral.

Course materials: Literature: Selected parts of K. Grjotheim and H. Kvande (Editors): "Introduction to Aluminium Electrolysis - Understanding the Hall-Heroult Process", 2nd Edition, Aluminium Verlag, Düsseldorf, 1993.

Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	C

TMT5500 Process Metallurgy and Electrolysis, Specialization Project

Lecturer: Professor Trygve Foosnæs
Weekly hours: Autumn: 24S = 15.0 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The student shall learn to attain in-depth knowledge of a specific subject area using scientific methods, i.e. acquire completing knowledge through literature studies and use of other sources. Furthermore, the student shall learn to complete a large independent project work, including setting up a project plan with milestones, reporting preliminary results and writing a project report according to established standards.
Recommended previous knowledge: The subject is an essential part of the compulsory activities for students specialising in the Master of Science programme for Light Metals Production.
Academic content: The specialization comprises a project work (15 Stp) and theoretical subjects corresponding to 7.5 Stp (3.75 Stp each). The project work will usually be an integrated part of ongoing research activities at the department. During the semester the students will be trained to work systematic within the specific field as well as obtain detailed knowledge through both practical work and literature surveys.
Teaching methods and activities: Independent project work with academic supervision. Througout the semester the students will be given mandatory training in seeking literature, report writing and presentation techniques. In connection with the submission of the project report, there will be a seminar where the students give a compulsory oral presentation of their project work.
Course materials: Selected parts of relevant textbooks and literature articles.
Assessment: Work

Forms of assessment	Date/Time	Percentage	Exam. support
EXCERCISES		100/100	

TMT5505 Process Metallurgy and Electrolysis, Specialization Course

Lecturer: Professor Trygve Foosnæs
Weekly hours: Autumn: 12S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: Give specialization within a given part of the total range of subjects.
Recommended previous knowledge: The subject is an essential part of the compulsory activities for students specialising in the Master of Science programme for Light Metals Production.
Academic content: The theoretical subjects which is a part of the spesialization is mentioned under, but other options are possible depending on the specific background of the given student. Each course correspond to 3.75 SP.
1. Processmetallurgy and electrolysis. Coordinator: Prof. Trygve Foosnæs.
Recommended theoretical subjects:
TMT1 Process Metallurgy
TMT2 Recycling
TMT5 Electrolysis
TMT15 Resources, Energy and Environment
TMT16 Kinetics of Metallurgical Reactions
TMT8 Selfstudy by agreement
2. Ceramic Engineering and Functional Materials. Coordinator: Associate prof. Kjell Wiik.
Recommended theoretical subjects:
TMT3 Processing of ceramic materials
TMT4 Properties of ceramic materials
TMT13 Silisium - solar cells
TMT8 Selfstudy by agreement
Teaching methods and activities: The theoretical subjects will be organized as a combination of study groups, lectures and self-tuition. Re-scheduled exams will be held within the examination period.
Course materials: Selected parts of relevant textbooks and literature articles.
Assessment: Oral examination

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	100/100	D

MT8301 Carbon Materials Technology

Lecturer: Professor II Morten Sørlie
Weekly hours: Spring: = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Colloquim

Learning objectives: The course will provide an introduction to carbon science, technology and materials. The most important fundamental principles will be covered in more depth. From an engineering point of view it will be shown how the choice of raw materials and processing parameters can tailor carbon materials to given specifications within a wide property and application range.
Recommended previous knowledge: BSc or similar.
Academic content: The course is given every second year, next time will be spring 2009. Carbon materials used industrially will be treated with emphasis on fundamental principles and properties that have given carbon its broad industrial application. Lectures will also cover areas of carbon science and technology that more recently have resulted in great scientific activity. Lectures will cover raw materials, the carbonization process, graphitization, carbons refractory properties, oxidation processes, carbon electrodes in metallurgical and electrometallurgical industry, carbon fibers and carbon-carbon composites, active carbon, intercalation compounds, synthetic diamonds, fullerenes, and others.
Teaching methods and activities: Towards the end of the semester each student has to present a 30 min colloquium within a narrow part of the curriculum. The presentation will be evaluated and marked.
Course materials: Literature: Selected parts from published books and articles from publications.
Assessment: Written examination/Midterm

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	70/100	
MIDTERM EXAMINATION		30/100	

Department of Product Design Engineering

TPD5100 Ecodesign, Advanced Course

Lecturer: Førsteamanuensis Johannes Sigurjonsson
Weekly hours: Spring: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Assignments and group project

Learning objectives: This course presents the design function as a strategic tool to develop, design and implement industrial ecological systems, products and services. Industrial ecology is found as a promising concept in sustainable development. This course gives the students theory, methodological tools and practical case studies in how to accomplish change through the means of sustainable values in design processes.
Recommended previous knowledge: Basic knowledge of product development (Bachelor's degree in related subjects).
The course is required in the Master of industrial ecology; profile: Strategic design of product systems.
The course is taught in English. Please see the prerequisits to enter the Master programme of Industrial Ecology.
Academic content: This course provides detailed understanding of the role of design in an industrial ecological context. The course will have a specific focus on the interdependency between the business profile and the design activity. Strategic use of design is presented to promote sustainable development in a local as well as a global perspective. Design strategies are discussed as answers to chosen values for this type of development. This distinguishes strategic design from design strategies.
Issues of concern in the lectures and assignments:
-Design discourse concerning material and technological choices within strategies of "weak" and "strong" sustainability (Huesman 2003)
-The latest news within sustainable economy, business and network organisation
-The Factor X concept
-Scenario building in strategic work as a method to define long term framework for design decisions.
-Individual user needs and common welfare in a sustainable perspective.
-Human behaviour as an explicit and implicit impact on the environment.
-User-centered design solutions as a sustainability strategy and source to innovative solutions
These aspects will be both qualitatively and quantitatively placed in context with product and system design, and evaluated as guidelines for design of new product and system solutions.
Teaching methods and activities: The students will follow the lectures in Ecodesign TPD4145, however, additional lectures are given to the master students as well as specific assignments. Guestlecturers will be invited for specific detailing in some of the themes.
Grading: individual written exam 60%, group project and assignments 40%. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: Compendium and lectures.
Assessment: Written examination/Work

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	60/100	A
EXCERCISES		40/100	

Department of Petroleum Engineering and Applied Geophysics

TPG4120 Engineering and Environmental Geophysics

Lecturer: Førsteamanuensis II Jan Steinar Rønning
Weekly hours: Spring: 2F+2Ø+8S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: Applications of geophysical methods for mapping the underground for technical purposes, groundwater, soil mechanical problems and for environmental purposes. Mapping overburden sediments, quality of rock, ground water, soil and water contamination, etc.
Recommended previous knowledge: Course TPG4100 Physics and geophysics or corresponding basic course in Applied Geophysics.
Academic content: Electrical methods. Resistivity (RP). Profiling. Vertical electrical sounding (VES). EM methods (VLF). Radar (GPR). Refraction seismics. Reflection seismics. Nuclear/Proton magnetic resonance (NMR, PMR). Logging methods.
Teaching methods and activities: Project work (PBL). Interpretation of refraction seismics. Demonstration in field. Lectures. Exercises count for 50% of the final grade. The course will be held in English if international masterstudents attend.
Course materials: John M. Reynolds: An Introduction to Applied and Environmental Geophysics, Wiley, or Telford, Geldart, Sheriff: Applied Geophysics, Cambridge. Course notes. NGU-reports.
Assessment: Oral examination/Work

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	50/100	D
EXCERCISES		50/100	

TPG4125 Seismic Wave Propagation

Lecturer: Førsteamanuensis Egil Tjåland
Weekly hours: Autumn: 4F+2Ø+6S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The subject will give an overview and a theoretical understanding of how seismic waves propagate in the earth, with emphasize on the application of reflection seismics for hydrocarbon exploration.
Recommended previous knowledge: Course TPG4100 Physics and Geophysics.
Academic content: Wave equation and wave propagation. One-dimensional wave propagation. Elasticity theory. P- and S-waves. Acoustic Impedance Reflection and Transmission ofplane waves. Dsorption. Diffraction. Geometrical spreading. Ray-tracing. Finite difference modelling. Geometry of wave paths. Traveltime approximations and traveltime corrections. Multiple reflections. Seismic noise. Interpretation of velocity analysis.
Teaching methods and activities: Lectures, field courses and exercises. PBL. The exam can be changed from written to oral at the postponed exams (continuation exam).
Course materials: Sheriff and Geldart: Exploration Seismology, Cambridge.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TPG4130 Seismic Interpretation

Lecturer: Førsteamanuensis Egil Tjåland
Weekly hours: Spring: 2F+3Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The subject will give an overview in advanced interpretation and modelling of reflection seismic data using state-of-the-art computer applications.
Recommended previous knowledge: Course TPG4125 Seismic Wave Propagation is recommended.
Academic content: Interpretation of two and three dimensional data on graphical work station. Generation of seismic time contour maps. Depth conversion of seismic time map (both from stacked sections and time migrated sections). Inversion of seismic data after stack. Three dimensional seismic modelling using ray-tracing. Use of seismic modelling to plan seismic data acquisition.
Teaching methods and activities: Lectures and exercises on work station. Excercises count for 50% of the final grade. PBL.
Course materials: Compendiums.

Assessment: Oral examination/Work

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	50/100	D
EXCERCISES		50/100	

TPG4145 Reservoir Fluids and Flow

Lecturer: Professor Curtis Hays Whitson
Weekly hours: Autumn: 4F+6Ø+2S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The students should learn to apply the fundamentals of flow and phase behavior in petroleum reservoirs through example applications. Emphasis is made to link the interaction of fluid flow and phase behavior, and its impact on well and reservoir performance.
Recommended previous knowledge: None.
Academic content: The PVT part describes reservoir fluid properties, hydrocarbon phase behavior, PVT lab tests, and use of PVT data in reservoir calculations. The flow part of the course treats single-well behavior for steady state condition of gas and oil wells, as well as material balance calculation.
Teaching methods and activities: Lectures, exercises and project work. Exercises count for 40% of the final grade. Project work, PBL. Lectures are held in English. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: Parts of Phase Behaviour SPE monograph (Whitson and Brule). Distributed notes and articles. E-notes on the internet.
Assessment: Written examination/Work

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	60/100	C
EXCERCISES		40/100	

TPG4150 Reservoir Recovery Techniques

Lecturer: Professor Jon Kleppe
Weekly hours: Autumn: 4F+4Ø+4S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The course aims at giving the students extensive knowledge of physical parameters, behavior, principles and methods related to recovery of oil and gas from reservoirs.
Recommended previous knowledge: Recommended background is passed TPG4112 Geomechanics and Flow in Porous Media and TPG4115 Reservoir Properties, or similar.
Academic content: The course addresses internal and external energy sources for reservoir production, and analysis of their influence on recovery of oil and gas from the various types of reservoirs. Topics: Oil, gas and condensate reservoir systems; microscopic and macroscopic displacement efficiency; natural drive mechanisms; injection of water and gas; material balance analysis; flow equations; simplified recovery estimation methods.
Teaching methods and activities: Lectures, obligatory exercises and group project. Folder evaluation will be basis for grade, and includes final exam (60%) and exercises/group work (40%). Each element is %-based, while final grade is letter-based. The lectures are in English. Retake exams may be oral.
Course materials: Course material will be given at semester start.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	60/100	D
EXCERCISES		40/100	

TPG4160 Reservoir Simulation

Lecturer: Professor Jon Kleppe
Weekly hours: Spring: 4F+4Ø+4S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The course aims at giving the students basic knowledge of numerical simulation of fluid flow in petroleum reservoirs.
Recommended previous knowledge: Recommended background is passed TPG4112 Geomechanics and Flow in Porous Media, TPG4115 Reservoir Properties and TPG4150 Reservoir Recovery Techniques, or similar.
Academic content: The course partial differential equations for one-phase and multi-phase flow in porous materials, and numerical methods for solving these. Topics: Summary of rock and fluid properties; derivation of PDE's; numerical solution of

PDE's using finite differences; methods for solving linear and non-linear equations; discussion of different types of reservoir simulation methods; practical sides of reservoir simulation applications.
Teaching methods and activities: Lectures, obligatory exercises and group project. Folder evaluation will be basis for grade, and includes final exam (60%) and exercises/group work (40%). Each element is %-based, while final grade is letter-based. The lectures are in English. Retake exams may be oral.
Course materials: Course material will be given at semester start.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	60/100	D
EXCERCISES		40/100	

TPG4170 Reservoir Seismics

Lecturer: Professor Rune Martin Holt, Professor Bjørn Ursin
Coordinator: Professor Bjørn Ursin
Weekly hours: Spring: 4F+1Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The topic shall give the students an understanding of rock physics and seismic methods used in reservoir geology and reservoir description. The exercises shall make the students able to do quantitative interpretation of seismic data.
Recommended previous knowledge: Course TPG4125 Seismic Wave Propagation.
Academic content: P- and S-waves in isotropic and anisotropic rocks. Principles for the measurement of acoustic properties in the laboratory. Simple rock physics models, mainly based on the Biot-Gassmann poro-elastic theory and critical porosity. Observed and modelled relations between seismic velocities and porosity, lithology, fluid saturation and mechanical stress/pore pressure. Seismic amplitude as a function of offset (AVO) and angle (AVA). Inversion of seismic data. Reservoir monitoring using repeated seismic measurements. Ocean bottom seismics.
Teaching methods and activities: Lectures and exercises. The lectures will be held in English if international masterstudents attend. The exam can be changed from written to oral at the postponed exams (continuation exam).
Course materials: Compendiums and articles.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TPG4177 Carbonate Reservoir Characterization

Lecturer: Amanuensis Helge Langeland, Professor Mai Britt E. Mørk
Coordinator: Amanuensis Helge Langeland
Weekly hours: Autumn: 4F+2Ø+6S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: Give an overview of basic terminology and concepts of carbonate rocks in order to understand the geology and the use of seismics, petrophysics, reservoir engineering and well testing in the interpretation of carbonate reservoirs.
Recommended previous knowledge: Basic knowledge of geology and petrophysics.
Academic content: Carbonate reservoirs are considered to be the most significant source of hydrocarbon production for this century. This course is offered to provide an introduction to carbonate reservoir evaluation through use of academic and industry course material. Basic terminology and concepts will be taught through lectures, group work and self study assignments. What challenges do carbonate reservoirs give? Examples of different carbonate reservoirs will be used to demonstrate the importance of integrating engineering and geoscience data and understanding in effective reservoir management. The integration of all disciplines will be stressed through lectures, group work and self-study assignments. Data will be provided for practical exercises on evaluation of carbonate reservoirs.
Teaching methods and activities: Lectures and exercises, self study assignments. Data sets will be provided for group work and self study to teach the methods of "how to evaluate a carbonate reservoir". Tests in the semester will count 30% on the exam grade. On retake of exam, an oral exam may be given.
Course materials: Relevant reference material will be provided during the course. A good basic background overview is found in: Scholle, P., A. Bebout, D.G, and Moore, C.H., eds: Carbonate depositional environments. American Association of Petroleum Geologists, Memoir 33.
Assessment: Written examination/Midterm

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	70/100	D
MIDTERM EXAMINATION		30/100	D

TPG4180 Petrophysics, Interpretation of Well Data, Advanced Course

Lecturer: Professor II Terje Eidesmo, Professor Rune Martin Holt, Amanuensis Helge Langeland
Coordinator: Amanuensis Helge Langeland
Weekly hours: Spring: 4F+2Ø+6S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: Give a deeper understanding of data from boreholes, measurement methods used in boreholes, the information potential of these data and use in integrated evaluation of reservoirs.
Recommended previous knowledge: The course builds on course TPG4175 Petrophysics BC, TPG5120 Petrophysics BC or similar knowledge.
Academic content: The course focuses on selected topics from well data acquisition methods and the interpretation of these data, extending the concepts taught in the basic course in petrophysics. There will be project exercises connected to the Gullfaks database. Integration with other data types. Basic petrophysical relations and points of view. Radiometric methods in open and cased boreholes: Spectrometry - natural and induced, neutron lifetime logging (saturation behind cases), mud logging. Nuclear magnetic resonance, NMR. Properties of clay and shale. Water saturation models in shaly formations. Uses of core data. Pressure measurements. Acoustic and mechanical rock properties. Properties of carbonates.
Teaching methods and activities: Lectures, obligatory exercises, well data analysis software laboratory. Project based learning methods (PBL) and group work is used. The course is given in English when foreign students are attending. Semester test will count 30% on the exam grade. The exam can be changed from written to oral exam at the postponed exam.
Course materials: Articles, lecture notes and other relevant literature.
Assessment: Written examination/Midterm

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	70/100	D
MIDTERM EXAMINATION		30/100	D

TPG4185 Formation Mechanics

Lecturer: Professor Rune Martin Holt
Weekly hours: Autumn: 3F+3Ø+6S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The students shall have a basic understanding of how stresses are changed as a result of petroleum production, and how these changes influence recovery and 4D seismics, plus stability during drilling and production. The students shall be able to perform computations of reservoir compaction and surface subsidence, mud weight limits for stable drilling, critical drawdown for initiation of sand production and estimated sand mass. The students shall have an overview of fundamentals and applications of hydraulic fracturing.
Recommended previous knowledge: Basis in mechanics.
Academic content: Reservoir geomechanics; Introduction to poroelasticity theory. Reservoir compaction, linear elastic model and inelastic effects. Surface subsidence. Stress evolution during production. Compaction as a drive mechanism. Stress effects on porosity and permeability. Coupled reservoir simulation. Link to 4D-seismics.
Borehole stability: Diagnostics. Critical mud weight limits to prevent hole collapse and mud losses. Effects of temperature and mud composition on borehole stability. Stability of deviated and horizontal holes. Effects of plasticity. Modelling of borehole stability.
Sand and particle production: Basic mechanisms. Sand control. Sand predition. Volumetric sand production.
Hydraulic fracturing: Initiation and growth of hydraulic fractures. Thermal fracturing during water injection. Use of fracturing during simulation, for stress determination, and for waste storage.
Teaching methods and activities: Lectures and exercises. PBL. Students will accomplish a semester project and present the results oral and in writing. This work counts for 25% of the final grade. The lectures are held in English if international masterstudents attend. Retake exams may be oral.
Course materials: Will be given at semester start.
Assessment: Written examination/Work

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	75/100	B
EXCERCISES		25/100	

TPG4190 Seismic Data Acquisition and Processing

Lecturer: Professor Martin Landrø
Weekly hours: Autumn: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The course gives an introduction to how huge amounts of seismic data are handled and processed.

Recommended previous knowledge: Courses TPG4125 Seismic Wave Propagation and TPG4165 Geophysical Signal Analysis.
Academic content: Seismic data acquisition. Seismic sources and receivers. Seismic arrays. Spatial sampling. Deconvolution. Velocity analysis and stacking. Traveltime equations. Two-dimensional filtering. Dip moveout. Wave equation migration. 3D seismic and VSP.
Teaching methods and activities: Lectures. Exercises in datalab. Lessons are based on project, where the project consists of processing a seismic data set. The project work counts for 40% of the final grade. The lectures are held in English if international masterstudents attend. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: Ö. Yilmaz: Seismic data processing, SEG, Tulsa. Compendiums.
Assessment: Written examination/Work

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	60/100	D
EXCERCISES		40/100	

TPG4195 Gravimetry and Magnetometry

Lecturer: Førsteamanuensis II Jörg Ebbing
Weekly hours: Autumn: 4F+1Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The topic will give knowledge on modern techniques for processing and interpretation of gravimetric and magnetic data. Exercises include processing, map production, interpretation and forward and inverse modelling using PC software.
Recommended previous knowledge: Course TPG4100 Physics and Geophysics or corresponding previous knowledge.
Academic content: Potential field theory. Instrumentation. Gravity and magnetic measurements, processing, and image analysis. Map production. Interpretation of potential field data, including Fourier analysis, regional-residual analysis,3D Euler Deconvolution. Petrophysical properties of rocks. Forward modelling of potential fields with constraints taken from geology and seismic data. Available potential field data bases in Norway.
Teaching methods and activities: Lectures and exercises. Exercises are mandatory.
Course materials: Blakely, R.J., 1996. Potential Theory in Gravity and Magnetic Applications. Cambridge University Press. ISBN: 0-521-57547-8
Assessment: Oral examination

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	100/100	D

TPG4205 Drilling Techniques Pressure Control

Lecturer: Førsteamanuensis Pål Skalle
Weekly hours: Spring: 3F+1Ø+8S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: Provide a summary over the most important safety elements that constitute a drilling programme; evaluations and initiatives to avoid or solve problems.
Recommended previous knowledge: Basic topics in drilling.
Academic content: Pressure in sedimentary formations, prediction or pore and fracture pressure, setting and cementation of casing, conventional pressure control (detection of unstable hole, well shut-in, killing procedures), mud transport of free gas and gas in solution, security aspects concerning drilling in deep water (cold environment, lowfracture gradients, high kick-frequency, hydrate formation, shallow gas and water currents).
Teaching methods and activities: Lectures and PBL-group work. Port folio evaluation gives the basis for final grade; written exam 50%, exercises 20%, midterm exam 30%. Results are presented by %, final grade by letter grade. The lectures will be held in English if international masterstudents attend. The exam can be changed from written to oral at the postponed exams (continuation exam).
Course materials: SPE book: Applied Drilling Engineering. Compendium.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	50/100	D
EXCERCISES		20/100	
MIDTERM EXAMINATION		30/100	D

TPG4215 High Deviation Drilling

Lecturer: Professor Arild Rødland
Weekly hours: Autumn: 4F+1Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.

Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The topic gives an introduction to the methods used for high deviation and horizontal drilling, identifies conditions which are of significant importance and gives an insight into calculations which are necessary for planning and accomplishment of such boreholes.
Recommended previous knowledge: Basics in drilling engineering.
Academic content: Deviation drilling, history and background. Actually, viewpoints on benefits and problems, methodology for assessment of feasibility of different alternatives of well types. Presentation and analysis of equipment and methodology for deviation, high deviation and horizontal boreholes, axial movements, rotation and pumping, also borehole pressure control equipment and methodology. Analysis on methodology of borehole steering, directional changes and control, design and implementation of complex borehole trajectories, presentation of related equipment and components. Borehole trajectory calculations, accuracies. Forcebalances in the borehole, analysis; tension, compression, buckling criteria, fatigue. Application of borehole tractors, concepts and consequences. Drilling of slimhole; use of coiled tubing: Benefits, problems, changes in force- and power application analysis. Discussions.
Teaching methods and activities: Lectures and exercises. Exercises count for 25% of the final grade. The course is held in English if international masterstudents attend. The exam can be changed from written to oral at the postponed exams (continuation exam).
Course materials: Compendium. Relevant textbooks will be announced at semester start.
Assessment: Written examination/Work

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	75/100	A
EXCERCISES		25/100	

TPG4220 Drilling Fluid

Lecturer: Førsteamanuensis Pål Skalle
Weekly hours: Spring: 3F+1Ø+8S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: Present how the drilling fluid and hydraulic elements in the drilling programme are decided.
Recommended previous knowledge: Basic subjects in drilling.
Academic content: Different types of drilling fluid and selection of these; driling fluid rheology, density and filter properties, clay mineralogy and the clay's reaction with water, polymers, oil-based drilling fluid, chemical and mechanical hole stability; laminar and turbulent pressure loss in pipes and annuli; hydraulic optimization.
Teaching methods and activities: Lectures and PBL-group work. Port folio evaluation gives the basis for final grade; written exam 50%, exercises 20%, midterm exam 30%. Results are presented by %, final grade by letter grade. The lectures will be held in English if international masterstudents attend. The exam can be changed from written to oral at the postponed exams (continuation exam).
Course materials: SPE textbook: Applied Drilling Engineering. Compendium
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	50/100	D
EXCERCISES		20/100	
MIDTERM EXAMINATION		30/100	D

TPG4225 Fractured Reservoirs

Lecturer: Professor Ole Torsæter
Weekly hours: Spring: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The students will learn basic theory for analyzing flow in fractured reservoirs. The students should learn analytical calculation methods and methods based on numerical simulation through field example applications.
Recommended previous knowledge: Basic knowledge in reservoir engineering.
Academic content: Classification of and concepts for fractured porous media. Model selection. Geological reasons for fracturing. Single phase flow: well tests, storage effects, type curves. Drive mechanisms: capillary forces, gravity, viscous forces, diffusion. Production models: water drive models, gas cap models, modified material balance models and numerical simulation models.
Teaching methods and activities: Lectures and exercises. The lectures will be held in English if international masterstudents attend. The exam can be changed from written to oral at the postponed exams (continuation exam).
Course materials: Articles and lecture notes.

Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	A

TPG4230 Field Development and Operations

Lecturer: Professor Michael Golan
Weekly hours: Spring: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: To develop capabilities to integrate all petroleum engineering skills including: reservoir, petrophysics, drilling, production and facilities engineering into a process of planning and managing gas and oil fields during their entire life cycle. Upon completion of the course, the participants will understand the procedures involved in planning and managing field production. They will understand the concept of Integrated Field Management and will be acquainted with commercial programs to perform operations technologies, production facilities, seabed and sub-sea facilities, and general approach to offshore field development.
Recommended previous knowledge: TPG4145 Reservoir Fluids and Flow or equivalent petroleum engineering knowledge. Engineering courses in flow and process technology. Previous courses in reservoir, drilling, production and petrophysics.
Academic content: The course is teaching the methodology and the petroleum engineering skills needed to plan the life cycle of gas and oil fields from the discovery, through the assessment phase, the project and development phases, the field operations period and the abandonment phase. It addresses topics as reserve and recovery estimation, reservoir depletion, production scheduling, number of wells and well placement, planning of production gathering and testing systems, designing well construction, well and production system performance, field processing facilities and export product control.
The course introduces the concept of Integrated Field Mangement, including performance and optimization of field production from the reservoir to the export point.
Teaching methods and activities: Lectures and exercises including one small scope individual project. The exercises and the project account for 40% of the final grade of the course. The course is taught in English. The lectures and exercises will relate to an offshore field in Norway (North Sea or Barents Sea) and will use this field as the focus of the learning.
Course materials: Given at semester start.
Assessment: Oral examination/Work

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	60/100	D
EXCERCISES		40/100	

TPG4235 Well Testing, Advanced Course

Lecturer: Professor Tom Aage Jelmert
Weekly hours: Autumn: 4F+1Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: Obtain practical and theoretical knowledge of well test interpretation. Be able to select and apply the proper mathematical model. Interpretation of special well tests.
Recommended previous knowledge: Basic topics in mathematics. TPG4115 Reservoir Characteristics is also recommended.
Academic content: Repetition of the Laplace transformation. Solutions of the diffusivity equation. Elementary discussion of Bessel functions. Flow period diagnostic. Limiting equations. Well test interpretation in homogeneous, fractured and layered reservoirs. Horizontal wells. The pressure derivative. The effect of anisotropy. Multi-phase flow. Multi-rate testing. Constant pressure testing.
Teaching methods and activities: Lectures and exercises. (PBL). The lectures are held in English.
Course materials: Sabet, M.A.: Well Test Analysis, Houston TX, Gulf Publishing Co. Handouts.
Assessment: Oral examination

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	100/100	D

TPG4240 Reservoir Evaluation

Lecturer: Professor Tom Aage Jelmert
Weekly hours: Spring: 3F+1Ø+8S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: Obtain practical and theoretical exerience of well test interpretation. Comparison of well test interpretation against core analysis by the use of p-averages and statistics. Some knowledge about supporting topics.
Recommended previous knowledge: Elementary knowledge of well testing is recommended but not necessary. A short repetition will be given at lecture start.

Academic content: Repetition of elementary well testing. A multi-disiplinary discussion on the determination and description of reservoir properties. Well testing will be emphasized. Well testing depends on results from other fields, like logging, statistics and petrophysics. A short discussion of selected topics from these areas will be provided.
Teaching methods and activities: Lectures and exercises.
Course materials: R.N. Horne: Modern Well Test Analysis. In addition notes published by the department.
Assessment: Oral examination

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	100/100	D

TPG4500 Formation Evaluation - Technology, Specialization Project

Lecturer: Professor Rune Martin Holt, Professor Tom Aage Jelmert, Professor Jon Kleppe, Amanuensis Helge Langeland, Professor Ole Torsæter, Professor Curtis Hays Whitson
Coordinator: Professor Ole Torsæter
Weekly hours: Autumn: 24S = 15.0 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The student shall learn to immerse in a specific topic within Formation Evaluation based on scientific work methods, e.g. completive knowledge through literature studies and other sources and combine this with own knowledge. Further the student shall learn to complete a major independent project work, including preparing a project plan with milestones, report results and write a project report in accordance to approved standards.
Recommended previous knowledge: It is provided that the student has completed a study which is required to choose specialization in formation evaluation. The study can be in accordance to requirements given in the study plan or exeptional a study which is approved by the teacher.
Academic content: The following topics of 7,5 credit points are offered: Petrophysics, acoustics, PVT/EOR/GAS, Reservoir evaluation, Fractured reservoirs, Applied reservoir simulation, Reservoir physics, Integrated operations. One week field course may be included.
Teaching methods and activities: Independent project work with guidance.
Course materials: Given at the beginning of the semester.
Assessment: Work

Forms of assessment	Date/Time	Percentage	Exam. support
EXCERCISES		100/100	

TPG4505 Formation Evaluation - Engineering, Specialization Course

Lecturer: Professor Rune Martin Holt, Professor Tom Aage Jelmert, Professor Jon Kleppe, Amanuensis Helge Langeland, Professor Ole Torsæter, Professor Curtis Hays Whitson
Coordinator: Professor Ole Torsæter
Weekly hours: Autumn: 12S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The course gives a deeper understanding of problems within selected parts of Formation Evaluation.
Recommended previous knowledge: It is provided that the student has completed a study which is required to choose specialization in formation evaluation. The study can be in accordance to requirements given in the study plan or exeptional a study which is approved by the teacher.
Academic content: The following topics of 7,5 credit points are offered: Petrophysics, acoustics, PVT/EOR/GAS, Reservoir evaluation, Fractured reservoirs, Applied reservoir simulation, Reservoir physics, Integrated operations. One week field course may be included.
Teaching methods and activities: The topic is given as lectures, eventually with exercises, seminars or self studies. Postponed exam is held within the end of the exam period.
Course materials: Given at the beginning of the semester.
Assessment: Oral examination

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	100/100	D

TPG4510 Petroleum Production, Specialization Project

Lecturer: Professor Harald Arne Asheim, Professor Michael Golan, Professor Jon Steinar Gudmundsson, Professor Sigbjørn Sangesland
Coordinator: Professor Harald Arne Asheim
Weekly hours: Autumn: 24S = 15.0 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The student shall learn to immerse in a specific topic within Petroleum Production based on scientific work methods, e.g. completive knowledge through literature studies and other sources and combine this with own knowledge. Further the student shall learn to complete a major independent project work, including preparing a project plan with milestones, report results and write a project report in accordance to approved standards.
Recommended previous knowledge: It is provided that the student has completed all courses that are listed as obligatory for the specialization petroleum production in the study plan, or gets an approval from the teacher.
Academic content: The following topics of 7,5 credit points are offered: Production lab., Techniques, Modelling and simulation of production processes, Flow in production wells, Nature gas technology, Production technology, Process technology, Field PUD (Plan for development and operation), Well technology. Integrated operations. One week field course may be included.
Teaching methods and activities: Independent project work with guidance.
Course materials: Given at the beginning of the semester.
Assessment: Work

Forms of assessment	Date/Time	Percentage	Exam. support
EXCERCISES		100/100	

TPG4515 Petroleum Production, Specialization Course

Lecturer: Professor Harald Arne Asheim, Professor Michael Golan, Professor Jon Steinar Gudmundsson, Professor Sigbjørn Sangesland
Coordinator: Professor Harald Arne Asheim
Weekly hours: Autumn: 12S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The course gives a deeper understanding of problems within petroleum production.
Recommended previous knowledge: It is provided that the student has completed all courses that are listed as obligatory for the specialization petroleum production in the study plan, or gets an approval from the teacher.
Academic content: The following topics of 7,5 credit points are offered: Production lab., Techniques, Modelling and simulation of production processes, Flow in production wells, Nature gas technology, Production technology, Process technology, Field PUD (Plan for development and operation), Well technology. Integrated operations. One week field course may be included.
Teaching methods and activities: The topics are given as lectures, eventually with exercises, seminars or self studies. Postponed exam is held within the end of the exam period.
Course materials: Given at the beginning of the semester.
Assessment: Oral examination

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	100/100	D

TPG4520 Drilling Engineering, Specialization Project

Lecturer: Professor Rune Martin Holt, Professor Arild Rødland, Professor Sigbjørn Sangesland, Førsteamanuensis Pål Skalle
Coordinator: Førsteamanuensis Pål Skalle
Weekly hours: Autumn: 24S = 15.0 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The student shall learn to immerse in a specific topic within Drilling Engineering based on scientific work methods, e.g. completive knowledge through literature studies and other sources and combine this with own knowledge. Further the student shall learn to complete a major independent project work, including preparing a project plan with milestones, report results and write a project report in accordance to approved standards.
Recommended previous knowledge: It is provided that the student has completed all courses listed as obligatory for the specialization drilling in the study plan, or gets an approval from the teacher.
Academic content: The following topics of 7,5 credit points are offered: Drilling fluid technology, Formation mechanics, Underbalanced drilling, Geotermal energy drilling: drilling in recovery process, Deepwater technology, Integrated operations. One week field course may be included.
Teaching methods and activities: Independent project work with guidance.
Course materials: Given at the beginning of the semester.
Assessment: Work

Forms of assessment	Date/Time	Percentage	Exam. support
EXCERCISES		100/100	

TPG4525 Drilling Engineering, Specialization Course

Lecturer: Professor Rune Martin Holt, Professor Arild Rødland, Professor Sigbjørn Sangesland, Førsteamanuensis Pål Skalle
Coordinator: Førsteamanuensis Pål Skalle
Weekly hours: Autumn: 12S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The course gives a deeper understanding of problems within drilling technology.
Recommended previous knowledge: It is provided that the student has completed all courses listed as obligatory for the specialization of drilling in the study plan, or gets an approval from the teacher.
Academic content: The following topics of 7,5 credit points are offered: Drilling fluid technology, Formation mechanics, Underbalanced drilling, Geotermal energy drilling: drilling in recovery process, Deepwater technology, Integrated operations. One week field course may be included.
Teaching methods and activities: The topics are given as lectures, eventually with exercises, seminars or self studies. Postponed exam is held within the end of the exam period.
Course materials: Given at the beginning of the semester.
Assessment: Oral examination

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	100/100	D

TPG4530 Reservoir Engineering, Specializaton Project

Lecturer: Professor Tom Aage Jelmert, Professor Jon Kleppe, Professor Ole Torsæter, Professor Curtis Hays Whitson
Coordinator: Professor Tom Aage Jelmert
Weekly hours: Autumn: 24S = 15.0 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The student shall learn to immerse in a specific topic within Reservoir Engineering based on scientific work methods, e.g. completive knowledge through literature studies and other sources and combine this with own knowledge. Further the student shall learn to complete a major independent project work, including preparing a project plan with milestones, report results and write a project report in accordance to approved standards.
Recommended previous knowledge: It is provided that the student completed all courses which are listed as obligatory for the specialization reservoir engineering in the study plan, or gets an approval from the teacher.
Academic content: The following topics of 7,5 credit points are offered: Applied reservoir simulation, Fractured reservoirs, PVT, EOR, Gas, Reservoir evaluation, Reservoir physics. Integrated operations. One week field course may be included.
Teaching methods and activities: Independent project work with guidance.
Course materials: Given at the beginning of the semester.
Assessment: Work

Forms of assessment	Date/Time	Percentage	Exam. support
EXCERCISES		100/100	

TPG4535 Reservoir Engineering, Specialization Course

Lecturer: Professor Tom Aage Jelmert, Professor Jon Kleppe, Professor Ole Torsæter, Professor Curtis Hays Whitson
Coordinator: Professor Tom Aage Jelmert
Weekly hours: Autumn: 12S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The course gives a deeper understanding of problems within reservoar engineering.
Recommended previous knowledge: It is provided that the student has completed all courses which are listed as obligatory for the specialization reservoir engineering in the study plan, or gets an approval from the teacher.
Academic content: The following topics of 7,5 credit points are offered: Applied reservoir simulation, Fractured reservoirs, PVT, EOR, Gas, Reservoir evaluation, Reservoir physics. Integrated operations. One week field course may be included.
Teaching methods and activities: The topics are given as lectures, eventually with exercises, seminars or self studies. Postponed exam is held within the end of the exam period.
Course materials: Given at the beginning of the semester.
Assessment: Oral examination

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	100/100	D

TPG4540 Petroleum Geophysics, Specialization Project

Lecturer: Førsteamanuensis II Jörg Ebbing, Professor Rune Martin Holt, Professor Martin Landrø, Amanuensis Helge Langeland, Førsteamanuensis II Jan Steinar Rønning, Førsteamanuensis Egil Tjåland, Professor II Trond H. Torsvik, Professor Bjørn Ursin
Coordinator: Førsteamanuensis Egil Tjåland
Weekly hours: Autumn: 24S = 15.0 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The student shall learn to immerse in a specific topic within Petroleum Geophysics based on scientific work methods, e.g. completive knowledge through literature studies and other sources and combine this with own knowledge. Further the student shall learn to complete a major independent project work, including preparing a project plan with milestones, report results and write a project report in accordance to approved standards.
Recommended previous knowledge: It is provided that the student has completed all courses which are listed as obligatory for the specialization geophysics in the study plan, or gets an approval from the teacher.
Academic content: The following topics are offered: Rock physics. Geoscience fieldcourse at Svalbard (3,75 points). Gravimetry and magnetometry. Fractured reservoirs. Petrophysics, selected theory, methods or computer applications. Plate tectonics and basin development. Reservoir seismics. Seismic imaging of sedimentary layers, field course (3,75 points). Seismic topics. All topics are 7,5 credit points except the field courses listed above.
Teaching methods and activities: Independent project work with guidance.
Course materials: Given at the beginning of the semester.
Assessment: Work

Forms of assessment	Date/Time	Percentage	Exam. support
EXCERCISES		100/100	

TPG4545 Petroleum Geophysics, Specialization Course

Lecturer: Førsteamanuensis II Jörg Ebbing, Professor Rune Martin Holt, Professor Martin Landrø, Amanuensis Helge Langeland, Førsteamanuensis II Jan Steinar Rønning, Førsteamanuensis Egil Tjåland, Professor II Trond H. Torsvik, Professor Bjørn Ursin
Coordinator: Førsteamanuensis Egil Tjåland
Weekly hours: Autumn: 12S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The course gives a deeper understanding of problems within geophysics.
Recommended previous knowledge: It is provided that the student has completed all courses which are listed as obligatory for the specialization geophysics in the study plan, or gets an approval from the teacher.
Academic content: The following topics are offered: Rock physics. Geoscience fieldcourse at Svalbard (3,75 points). Gravimetry and magnetometry. Fractured reservoirs. Petrophysics, selected theory, methods or computer applications. Plate tectonics and basin development. Reservoir seismics. Seismic imaging of sedimentary layers, field course (3,75 points). Seismic topics.
All topics are 7,5 credit points except the field courses listed above.
Teaching methods and activities: The topics are given as lectures, eventually with exercises, seminars or self studies. Postponed exam is held within the end of the exam period.
Course materials: Given at the beginning of the semester.
Assessment: Oral examination

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	100/100	D

TPG5100 Applied Mathematics and Computer Methods in Petroleum

Lecturer: Professor Tom Aage Jelmert
Weekly hours: Autumn: 2F+8Ø+2S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: Review of important methematical concepts and develop skills in numerical techniques and computer appøications used for solving petroleum related technical problems
Recommended previous knowledge: None.
Academic content: The course covers methods for curve fitting, numerical differentiation, integration, interpolation, solution of equations, solution of systems of equations, statistical methods, numerical solution of differential equations etc. With applications to typical problems in petroleum engineering and geoscience. Emphasis i put on individual programming and use of software packages on the department computers.
Teaching methods and activities: Lectures and Fortran programming exercises.

Course materials: W.H. Preuss and S.A. Teukolsky: Numerical Recipes in Fortran (2nd edition), Cambridge University Press, Cambridge, 1992. Fortran textbook to be announced.
Assessment: Work

Forms of assessment	Date/Time	Percentage	Exam. support
EXCERCISES		100/100	

TPG5110 PETROLEUM ECONOMICS
Petroleumsøkonomi
Petroleum Economics

Lecturer: Professor Jon Kleppe
Weekly hours: Spring: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: Enhance understanding of the principal economic framework within petroleum sector.
Recommended previous knowledge: BSc in petroleum engineering or equivalent.
Academic content: Oil price model; An introduction to the economic theory of exhaustible resources. Capital budgeting techniques and decision analysis: The main methods of evaluation of investment projects - including the effects of taxes and price variations, cost of capital and the main principles in economic risk analysis.
Teaching methods and activities: Lectures and exercises. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: Detailed information will be given at the beginning of the course.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TPG5120 Petrophysics, Basic Course

Lecturer: Amanuensis Helge Langeland
Weekly hours: Autumn: 4F+2Ø+6S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: Acquire knowledge and understanding of the basic concepts and techniques in petrophysics, to a degree sufficient to wither continue study petrophysics at a more advanced level or continue study in those disciplines which might not require more petrophysics competence than acquired from the basic course.
Recommended previous knowledge: BSc in an engineering discipline, including some geoscience study.
Academic content: Introduction to geology and petrology. Physical characterization of rocks, including porosity, permeability and fluid saturation. Fluid flow through porous media. Capillary pressure concepts. Interpretation of petrophysical data. Acquisition of log data including wireline logging coring. Principles of measuring techniques, incl. gamma ray, density, neutron, sonic, formation pressure testing, resistivity, nuclear magnetic resonance borehole measurements. Practical experience with cores. Basic log interpretation methods, Archie equation. Practical log evaluation methods in simple situations and predominantly siliciclastic environments. Influence of shale, rudimentary concepts on interpretation of shaly formations.
Teaching methods and activities: Lectures and exercises. Semester tests count total 30% of final grade. Exercises must have been completed to enter exam. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: Lecture notes, Western Atlas: Introductin to Well Log Analysis, Schlumberger: Log Interpretations Principles/Applications.
Assessment: Written examination/Midterm

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	70/100	D
MIDTERM EXAMINATION		30/100	D

TPG5200 Petroleum Engineering and Geoscience, Interdisciplinary Project

Lecturer: Amanuensis Helge Langeland, Førsteamanuensis Pål Skalle
Coordinator: Førsteamanuensis Pål Skalle
Weekly hours: Autumn: 5Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: Students will develop knowledge and expertice across traditional disciplines within exploration and production of oil and gas through a realistic project work. Students will be organized in groups, with students from petroleum geoscience and petroleum engineering.
Recommended previous knowledge: Third semester of the international MSc program in petroleum engineering and petroleum geoscience.

Academic content: The groups will be assigned realistic data from selected oil and gas provinces in the North Sea. The specific content of the project will be defined by the students on basis of a task defined by the industrial partner. To solve the task we have access to oil field data, and to engineering tools used by the industry. At the end of the project, the groups will make a formal presentation of the report for a panel of Professors.
Teaching methods and activities: Exercises (project work) 100%.
Course materials: Description of objectives, required data and references will be handed out.
Assessment: Work

Forms of assessment	Date/Time	Percentage	Exam. support
EXCERCISES		100/100	

Department of Production and Quality Engineering

TPK4120 Safety and Reliability Analysis

Lecturer: Professor Marvin Rausand, Professor Jørn Vatn
Coordinator: Professor Marvin Rausand
Weekly hours: Autumn: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Project

Learning objectives: The course gives an introduction to basic concepts and approaches related to analysis of safety and reliability of industrial systems and production/distribution of energy.
Recommended previous knowledge: Basic course in probability theory.
Academic content: Definition and discussion of basic concepts related to reliability and risk analysis. Functional analysis and identification and evaluation of faults and hazards. System analysis based on FMECA, reliability block diagrams and fault trees. Quantification of reliability and availability of technological systems. Measures for reliability importance. Analysis of repairable systems by Markov methods. Analysis of safety-critical systems (IEC 61508). Analysis of systems with common cause failures. Estimation of failure rates. Survey of reliability data sources.
Teaching methods and activities: Lectures, project work and exercises. A mandatory project shall be carried out, and will count 40% in the evaluation. The lectures and the exercises are in English when students who do not speak English take the course. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: M. Rausand and A. Høyland: System Reliability Theory; Models, Statistical Methods, and Applications, Second Edition, Wiley 2004. Supplementary notes.
Assessment: Written examination/Work

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	60/100	C
EXCERCISES		40/100	

TPK4140 Maintenance Management

Lecturer: Førsteamanuensis Per Schjølberg
Weekly hours: Autumn: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Project work/Semester project

Learning objectives: The aim is to present modern maintenance theory especially related to industrial challenges within terminology, maintenance mangement, future indicators, CMMS, modern analyses within maintenance and maintenance optimalization.
Recommended previous knowledge: TPK 4100 Operation Management
Academic content: To look upon the maintenance function as an investment for high dependability, quality and safety. Topics; maintenance planning, maintenance costs, maintenance concepts, organisation, LCC and LCP, Safety, Vulnerability, Aging, CMMS, KPIs, 5S, pit stop.
Teaching methods and activities: Lectures, project and exercises. The lectures and exercises are in English when students who do not speak Norwegian take the course. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: Textbook and articles
Assessment: Written examination/Work

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	60/100	D
EXCERCISES		40/100	

TPK4160 Value Chain Control and Applied Decision Support

Lecturer: Professor Heidi Dreyer, Professor II Jan Ola Strandhagen
Coordinator: Professor Heidi Dreyer

Weekly hours: Autumn: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises and a paper

Learning objectives: The course will give the students a fundamental understanding and knowledge about the supply chain system with the emphasize on processes, ICT, design, and control. The students will be given knowledge on supply chain principals and how value chains can be established, managed and improved.
Recommended previous knowledge: TPK4100 Operation Management.
TPK4135 Production logistics.
Academic content: Logistical operations in the supply chain systems: This contains theoretical aspects of supply chain management as well as major characteristics of the supply chain as product, customer/market, deliveries and distribution, production, replenishment, ICT, planning and forecasting. Methods for mapping, analyzing, smiulation and operation research will be applied for supply chain design and allocation of resources, localisation of manufacturing, inventory and distribution and environment- and cost considerations.
Teaching methods and activities: The lectures will be given in English if needed for foreign students. Lectures and exercises are a combination of literature and examples from textbooks, articles and practical cases in companies. The exercises counts for 40 % of the final grade. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: Will be given at the beginning of the semester. The literature and prescribed text is English.
Assessment: Written examination/Work

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	60/100	A
EXCERCISES		40/100	

TPK4500 Project Management, Specialization Project

Lecturer: Professor Bjørn Andersen, Førsteamanuensis Bassam A Hussein, Professor Asbjørn Rolstadås
Coordinator: Professor Asbjørn Rolstadås
Weekly hours: Autumn: 24S = 15.0 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: In depth scientific based study within a specific subject. The study is done through literature reviews, source search combined with own knowledge. The student should learn how to carry out an independent research work, including developing project plan with milestones as well as reporting deliverables and complete final report according to accepted standards.
Recommended previous knowledge: Fair knowledge of project management.
Academic content: The specialisation discusses aspects of execution of industrial projects. It may foces a given industrial sector, technology or product, or it may discuss project management as an overall topic.
Teaching methods and activities: Project work under supervision.
Course materials: Will be given at semester start.
Assessment: Work

Forms of assessment	Date/Time	Percentage	Exam. support
EXCERCISES		100/100	

TPK4505 Project Management, Specialization Course

Lecturer: Professor Bjørn Andersen, Førsteamanuensis Bassam A Hussein, Professor Asbjørn Rolstadås
Coordinator: Professor Asbjørn Rolstadås
Weekly hours: Autumn: 12S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The course will give the student in depth insight into selected topicis of project management.
Recommended previous knowledge: Fair knowledge of project management.
Academic content: The subject consists of two themes, each of 3.75 stp:
1- Sucess factores and benchmarking in projects
2- Management of ICT projects
Teaching methods and activities: Combination of selfstudy, miniseminars, and lectures. Postponed exam is held within the end of the exam period.
Course materials: To be defiend at course start.
Assessment: Oral examination

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	100/100	D

TPK4510 Production and Quality Engineering, Specialization Project

Lecturer: Førsteamanuensis Per Schjølberg
Weekly hours: Autumn: 24S = 15.0 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The student shall learn to go into specific topics based upon scientific methods through complemented knowledge, literature studies and combined this with learned knowhow and expertise. The student shall also learn to carry out an indepedent project work, which includes preparation of project plan and milestones, report status and present a project report based upon accepted standards. The project shall be related to: Production systems, Production management and RAMS.
Recommended previous knowledge: The following courses are required: TPK4105 Manufacturing Technology, TPK4115 Project Planning and Control 1, TPK4120 Safety and Reliability Analysis. Any deviations must be clarified with the department.
Academic content: The course includes aspects of manufacturing systems and processes as well as management and control of sustainable industrial production.
Teaching methods and activities: Independent project work with guidance and advice.
Course materials: The course material will be presented at the start of the semester and during the semester.
Assessment: Work

Forms of assessment	Date/Time	Percentage	Exam. support
EXCERCISES		100/100	

TPK4515 Production and Quality Engineering, Specialization Course

Lecturer: Førsteamanuensis Per Schjølberg
Weekly hours: Autumn: 12S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The course shall give a deeper understanding within production and quality engineering. The student will receive fundamental knowledge how to run modern production plants. The in-depth study will be related to: Production systems, Production management and RAMS.
Recommended previous knowledge: The following courses are required: TPK4105 Manufacturing Technology, TPK4115 Project Planning and Control 1, TPK4120 Safety and Reliability Analysis. Any deviations must be clarified with the department.
Academic content: The student shall select two Specialization Courses each 3.75 stp. Our department has the following Specialization Courses: Production Management, ICT in management prod./log; Production Management, Production Management classic/modern quality philosophy; RAMS Maintenance Management, RAMS risk and safety; Computational Intelligence and advanced robotics; Optimization of manufacturing processes.
Teaching methods and activities: The education methods will be: Lectures, colloquiums/seminars, exercises/articles, laboratory work and self-tuition.
Postponed examination will take place within the end of the examination period.
Course materials: Textbooks, reports, articles etc.
Assessment: Oral examination/Work

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	60/100	D
EXCERCISES		40/100	

TPK5100 Project Planning and Control

Lecturer: Førsteamanuensis Bassam A Hussein
Weekly hours: Autumn: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises, Project presentations

Learning objectives: The course aims at a thorough introduction to the project work, tools and techniques for evaluating, planning, and monitering projects.
Recommended previous knowledge: None.
Academic content: Management and project management, Projects, programmes and portfolios, Project types and categorization, Qualifications of project members, Project organization, general introduction, Project phases and life-cycle, Project structure, scope, and WBS, Project time schedules, costs and resources. Planning quality, cost and time, milestones and activities, Monitoring and controlling projects, Reporting progress, International standards and associations, Gender mainstreaming, Cultural mainstream.
Teaching methods and activities: Lectures, e-learning, assignments, games and project work.
Grading is based on project work (40 %) and final exam (60 %). The lectures and exercises are in English. If there is a re-sit examination, the examination form may be changed from written to oral.

Course materials: Will be given at course startup.
Assessment: Written examination/Work

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	60/100	A
EXCERCISES		40/100	

TPK5110 Quality and Risk Management in Projects

Lecturer: Professor Bjørn Andersen, Professor Jørn Vatn
Coordinator: Professor Bjørn Andersen
Weekly hours: Autumn: 2F+3Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: To give basic insight into the theoretical foundation and practical applications of quality and risk management in projects.
Recommended previous knowledge: Basic knowledge in statistics, probability theory, and project management.
Academic content: The project's surroundings, the stakeholder model, stakeholder analysis and management, the business processes of projects, process modeling of projects, performance assessment of projects, using quality improvement tools in projects. Risk managements focuses on risk identification, risk modeling and quantification, updating of risk model in light of the project evolution, and experience and feedback control loops.
Teaching methods and activities: Lectures and group work. The lectures and exercises are in English when students who do not speak Norwegian take the course. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: Selected papers and chapters in books and a course compendium in project risk identification and modeling.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	A

TPK5160 Risk Analysis

Lecturer: Professor II Stein Haugen, Professor Marvin Rausand
Coordinator: Professor II Stein Haugen
Weekly hours: Autumn: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Project

Learning objectives: The course gives an introduction to basic concepts and methods for risk analysis, and how risk analyses are applied in different industries and applications.
Recommended previous knowledge: Basic course in probability theory.
Academic content: Definition and discussion of basic concepts of risk analysis. Risk metrics. Risk acceptance criteria. Qualitative and quantitative methods for risk analysis, like preliminary hazard analysis, HAZOP, fault tree analysis, and event tree analysis. Analysis of human errors and organizational factors. Barrier analysis. Identification and analysis of common cause failures. Data sources and uncertainties. Rules, standards, and guidelines. Risk reduction and cost/benefit analysis. Survey of how risk analyses are performed within different industries and applications.
Teaching methods and activities: Lectures, project work and exercises. A mandatory project shall be carried out as group work, and will count 40% in the evaluation. The lectures and exercises are in English when students who do not speak Norwegian take the course. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: Specific course compendium.
Assessment: Written examination/Work

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	60/100	C
EXCERCISES		40/100	

TPK5165 RAMS Engineering and Management

Lecturer: Professor Marvin Rausand, Professor Jørn Vatn
Coordinator: Professor Marvin Rausand
Weekly hours: Spring: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Project

Learning objectives: The course provides insight on how to incorporate reliability, maintainability, and safety aspects into all phases of the life cycle of a product or a system.
Recommended previous knowledge: The course TPK4120 Safety and Reliability Analysis or similar background knowledge.
Academic content: Reliability, availability, maintainability, and safety (RAMS) requirements during the whole life cycle of a product or a system. RAMS management in product development. RAMS requirements and specification. Analytic

qualification and acceptance testing. Collection and utilization of experience data. Assessment of production regularity and life cycle cost/profits.
Teaching methods and activities: Lectures, project work and exercises. A mandatory project shall be carried out as group work, and will count 40% in the evaluation. The lectures and exercises are in English when students who do not speak Norwegian take the course. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: Selected papers and book chapters. Specific course compendium.
Assessment: Written examination/Work

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	60/100	C
EXCERCISES		40/100	

Department of Engineering Cybernetics

TTK4105 Control Systems

Lecturer: Amanuensis Trond Andresen
Weekly hours: Spring: 4F+3Ø+5S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: Control Systems includes mathematical modelling and control of physical procesess (machines, vehicles, chemical processes, power plants) -- any system that moves in time. The topic is a basic course in control theory, which is applied to a selection of examples.
Recommended previous knowledge: Calculus, 1, 2, 3 and 4K.
Academic content: Linear differential equations. State space representation. Transition matrix, decoupling, canonical forms. Linear approximations of nonlinear processes; linearisation. Block diagrams. Laplace transformation. Root loci. Responses for some typical processes--time- and frequency response. Stability of feedback systems, stability criteria. Frequency domain based synthesis of feedback systems: Servo control, process control with rejection of disturbances. P, PI, PID controllers, other serial controllers. Cascade control. Feedforward control. Basic discrete (digital) control of continuous systems.
Teaching methods and activities: Lectures, computer exercises and calculation exercises. There are eight calculation exercises, four of which have to be approved. Also three compulsory computer exercises in two-student groups, using MATLAB and Simulink. If there is a re-sit examination, the examination form may change from written to oral.
Course materials: Balchen, Andresen, Foss: Reguleringsteknikk, 2003 edition.
Assessment: Written examination/Midterm

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	75/100	D
MIDTERM EXAMINATION		25/100	D

TTK4160 Medical Imaging

Lecturer: Professor Bjørn Atle J. Angelsen
Weekly hours: Autumn: 4F+4Ø+4S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The course shall gives fundamental knowledge about physical phenomena, mathematical modelling, and algorithms used in medical imaging.
Recommended previous knowledge: Requires Calculus 1- 4, Physics, TTK4105 Control Systems, TTK4115 Linear Systems Theory, or similar background.
Academic content: Wave equation for acoustic fields. Solution in one and three dimensions. Approximations for long wavelengths (Poisson's equation) and short wave lengths (ray theory). Ultrasound transducers and beam forming. Scattering of ultrasound from soft tissue. Modelling of ultrasound imaging. The Doppler effect from moving scatterers. Measurement and imaging of blood velocities and contraction in the heart muscle. Wave equation for electromagnetic (EM) fields. Fields from active biological EM sources like neuro and muscle cells. Determination of sources from field measurements (Inverse problem). Optical measurements and imaging. X-Ray computer tomography. Magnetic resonance imaging of soft tissue.
Teaching methods and activities: Lectures, calculation exercises, demonstrations. Postponed/repeated exams may be oral.
Course materials: Announced at the start of the course.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TTK4165 Signal Processing in Medical Imaging

Lecturer: Professor Hans Torp
Weekly hours: Spring: 2F+6Ø+4S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The subject shall provide knowledge about signal processing methods and their applications within medical imaging diagnostics.
Recommended previous knowledge: The subjects TTT4120 Digital Signal Processing and TTK4160 Medical Imaging. Basic knowledge in mathematics, progamming and signal processing.
Academic content: Mathematical model for pulse-echo imaging systems based on signals in space and time. Effects from limited bandwidth and sampling on resolution in space and time. Representation of dynamic images by means of multi dimensional Fourier analysis. Practical reconstruction algorithms for 2D and 3D imaging. Use of grayscale/color graphics to achieve dynamic image information. Estimation of power spectrum and auto correlation applied on ultrasound Doppler signals. Application mainly within ultrasound-imaging, but also other medical imaging techniques will be treated.
Teaching methods and activities: Lectures, laboratory demonstrations, computer exercises, paper exercises. Postponed/ repeated exams may be oral.
Course materials: Textbook and/or lecture notes will be announced at start of the semester.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TTK4170 Modelling and Identification of Biological Systems

Lecturer: Professor Bjørn Atle J. Angelsen
Weekly hours: Spring: 4F+4Ø+4S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The subject shall give knowledge about modelling and parameter estimation applied to medical problems.
Recommended previous knowledge: Requires Calculus 1 - 4, Physics, TTK4105 Control Systems og TTK4115 Linear System Theory, or similar knowledge.
Academic content: The course treats mathematical modelling of biological systems, together with methods of using such models to extract information from medical measurements and images. Modelling and identification of the cardiovascular system is especially addressed, and also identification of systems without apriori models.
Teaching methods and activities: Lectures, computational exercises. Postponed/repeated exams may be oral.
Course materials: Given at the start of the course.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TTK4190 Guidance and Control

Lecturer: Professor Thor Inge Fossen
Weekly hours: Spring: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: Emphasis is placed on modelling of vessel motion and design of control systems for ships and underwater vehicles using state-of-the-art navigation systems.
Recommended previous knowledge: Courses TTK4105 Control Systems and TTK4150 Nonlinear Systems or equivalent. It is recommended to study this subject together with TMR4240 Marine Control Systems.
Academic content: Methods for design and implementation of industrial GNC systems for ships, semi-submersibles, underwater vehicles, and high-speed craft. This includes mathematical modeling of marine vessels and the environment (waves, currents and wind) in 6 DOF. Emphasis is placed on kinematics (Euler angles and unit quaternions), rigid-body dynamics, hydrodynamics and vectorial mechanics. Applied control theory and synthesis in terms of linear quadratic optimal control and state estimation (Kalman filtering), nonlinear observer theory, PID control with extensions to nonlinear systems, Lyapunov methods, sliding mode control, feedback linearization, backstepping designs, passivity, observer-based feedback, and observers design for marine vessels.
Teaching methods and activities: Lectures and problem sets. The assignments are given as computations and simulations in Matlab/Simulink. Hydrodynamic software (ShipX and WAMIT) is used to compute vessel data and to construct a vessel simulator for testing of feedback control systems. Portfolio evaluation is the basis for the final grade in the subject. Parts of the portfolio are final exam in writing 70%, and midterm test 30%. The result for each part is given in percentage units, while evaluation of the entire portfolio (the final grade) is given as a letter. If there is a re-sit examination, the examination form may be changed from written to oral.

Course materials: Thor I. Fossen: Marine Control Systems: Guidance, Navigation and Control of Ships, Rigs and Underwater Vehicles (Marine Cybernetics AS, 2002), ISBN 82-92356-00-2.
Conference and Journal Papers.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	70/100	A
MIDTERM EXAMINATION		30/100	A

TTK4500 Medical Cybernetics, Specialization Project

Lecturer: Professor Hans Torp
Weekly hours: Autumn: 24S = 15.0 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The student shall learn how to specialize in a given field using scientific methods like aquiring litterature and other relevant sources of infomation and combine this with existing knowledge. The student shall learn how to perform an independent project, including project planning with milestones, reporting of part results and progress and document the results in a report in accordance with given norms.
Recommended previous knowledge: Applicable to all students in the 5th year at E3.
Teaching methods and activities: Independent project work under supervision.
Course materials: To be announced.
Assessment: Work

Forms of assessment	Date/Time	Percentage	Exam. support
EXCERCISES		100/100	

TTK4505 Medical Cybernetics, Specialization Course

Lecturer: Professor Hans Torp
Weekly hours: Autumn: 12S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The topic gives specialization topics in medical technology. Skills in development of methodology and instrumentation for medical diagnosis, therapy and rehabilitation.
Recommended previous knowledge: Applicable to all students in the 5th year at E3.
Academic content: The specialization is composed of 2 selected specialization topics of 3,75 Sp, or 1 topic of 7.5 Sp. Proposed specialization topics:
Signal processing in ultrasound imaging,
Medical instrumentation,
Statistic signal processing in ultrasound imaging,
Ultrasound tranducers and front end technology,
TFY1 MR Imaging,
Instrumentation for neuromotor systems,
Pattern recognition,
Operator communication in automated systems,
Industrial network systems,
Theory for realtime systems,
Software components in industrial applications,
Real time operating systems,
Fast software development for embedded systems,
Teaching methods and activities: Teaching of the topics can be lectures, seminars, and self-studies. Postponed examm is held within the end of the exam period.
Course materials: As determined from chosen items, and announced at start of semester.
Assessment: Oral examination

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	100/100	D

Department of Electronics and Telecommunications

TTT4125 Information Theory, Coding and Compression

Lecturer: Professor Ralf Reiner Müller
Weekly hours: Autumn: 4F+1Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.

Grade: Letter grade Compulsory assignments: None

Learning objectives: The purpose of the course is twofold. Fisrtly, it aims at gving the student an understanding of formal mathematical models of information and communication that enables a quantifiacation of the theoretically optimal performance of a communication system. Secondly, the student should get insigth in how these theoretical limits can be reached through practical algorithms and methods.
Recommended previous knowledge: TTT4115 Communications or equivalent.
Academic content: Modelling and analysis of components in a generic communication system. Mathematical definitions of information content and channel capacity. Principles for optimal information transfer across various types of channels. Lossless data compression. Rate Distortion theory. Principles and methods for practical digital representations. Practical channel coding. Performance assessment relative to information theoretic limits.
Teaching methods and activities: Lectures and voluntary exercises. Postponed/repeated exams may be oral.
Course materials: T. Cover J. Thomas, Elements of Information Theory, 2nd ed, Wiley, 2006. J. Huber: Information Theory and its Applications in Communications Engineering, Lecture Notes, Erlangen, Germany 2002.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TTT4130 Digital Communication

Lecturer: Professor Nils Holte
Weekly hours: Autumn: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The course intends to give a basic introduction to principles and systems for transmission of digital information in different types of transmission channels.
Recommended previous knowledge: Courses TTT4120 Digital Signal Processing and TTT4115 Communications or equivalent knowledge.
Academic content: Principles for design of transmitters and receivers for digital transmission. Examples of channel models; twisted pair cables, fibreoptical transmission. Baseband transmission, line codes, digital modulation methods, symbol by symbol detection, optimum methods of detection, the Viterbi algorithm, adaptive equalisation, timing- and carrier recovery.
Teaching methods and activities: Lectures and excercises. There will be two compulsory computer based excercises plus a set of voluntary excercises. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: J R Barry, E A Lee, D G Messerschmitt, Digital Communication, 3’rd ed, Kluwer Academic Publishers, 2004.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TTT4135 Multimedia Signal Processing

Lecturer: Professor Andrew Perkis
Weekly hours: Spring: 3F+3Ø+6S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The subject should provide understanding of advanced techniques, algorithms and concepts for digital processing of audiovisual information. The processing will be highlighted by applications from multimedia systems.
Recommended previous knowledge: TTT4120 Digital Signal Processing or equivalent.
Academic content: The course treats audiovisual signals (speech, audio, images and video) and their characteristics relevant to applications in multimedia systems as well as principles and methods for digital processing of audiovisual information. The topics covered are: Statistical characterisation, parametric modelling and digital representation of speech, audio, images, video and graphics. Principles and algorithms for compression of speech, audio, images and video. Combined processing of different media types such as manipulation and integration of audiovisual information. Synthetic images and graphics. Annotation of audiovisual information and methods for search and retrieval of audiovisual information. Multimedia processors and implementation issues of multimedia systems. Multimedia applications, interactivity, multimedia presentations.
Teaching methods and activities: Lectures, voluntary exercises, mandatory computer exercises. Postponed/repeated exams may be oral.
Course materials: Jerry Gibson, Toby berger, Tom Lookabaugh, Dave Linbergh and Richard Baker: Digital Compression for Multimedia: Principles and standards, Morgan Kaufmann publishers, 1998.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TTT4140 Fundamentals of Navigation

Lecturer: Professor Børje Forssell
Weekly hours: Autumn: 4F+2Ø+6S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: To give students knowledge of the fundamental geodetic, mathematical and statistical requirements for design and utilisation of navigation systems and navigational data.
Recommended previous knowledge: Knowledge of Mathematics and Mathematical Statistics corresponding to a Bachelor's degree in Engineering Sciences at NTNU.
Academic content: The geophysical and geodetical fundamentals of navigation, positioning and localisation, i.e. shape and physics of the earth, reference and coordinate systems, maps and mapping projections, calculations on the surface of the earth, satellite navigation, error calculations and optimised utilisation of navigational data, particularly Kalman filtering.
Teaching methods and activities: Lectures and exercises. 10 exercises with solutions are available on the web site. The course can be held in English if international students attend. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: B. Forssell: Radionavigation Systems, Prentice Hall 1991(reproduced by Tapir). R. Grover Brown, P.Y.C. Hwang: Introduction to random signals and applied Kalman filtering, 3rd ed., John Wiley og Sons, Inc. 1997. Lecture notes.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TTT4150 Navigation Systems

Lecturer: Professor Børje Forssell
Weekly hours: Spring: 4F+2Ø+6S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: To familiarise the students with principles and requirements in electronics, signal processing, wave propagation and system technology fundamental to the design and use of navigation systems, as well as with the functions and performance of existing and planned navigation systems.
Recommended previous knowledge: Knowledge of electrical engineering fundamentals, mathematics, statistics and fundamentals of electronics, corresponding to a B.Sc. in electrical and electronics engineering. Signal processing, antennae, microwave techniques, wave propagation.
Academic content: Wave propagation along the surface of the earth and in the atmosphere, hyperbolic navigation, terrestrial and satellite-based navigation systems as LORAN-C, radio beacons, GPS, GLONASS, GALILEO, aircraft navigation systems, inertial navigation, and radar principles and methods.
Teaching methods and activities: Lectures, exercises and equipment demonstrations. The exercises consist of 10 problems with solutions, all accessible via the web site of the Department. The course can be held in English if international students attend. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: B. Forssell: Radionavigation Systems, Prentice Hall, 1991, (reproduced by Tapir). Texts about radar published by the Department of Telecommunications, journal articles.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TTT4155 Remote Sensing

Lecturer: Professor II Jens F. Hjelmstad
Weekly hours: Autumn: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The course gives the student an introduction to the use of electromagnetic waves for remote sensing and an overview of existing and future systems, with a focus on satellite systems.
Recommended previous knowledge: General knowledge of physics and electronics essential, specialised knowledge in microwave systems, electrooptics, laser systems, satellite design, digital signal processing and detection theory an advantage, but no prerequisite. NTNU subjects TFE4130 Electromagnetic and Acoustic Waves, TTT4120 Digital Signal Processing and TFE4160 Electro Optics are relevant, but not compulsory.
Academic content: Basic properties of electromagnetic waves. Scattering and interection of electromagnetic waves with gases and solid materials in optical, IR and microwave bands. Principles of remote sensing instruments, such as imager, radiometer, scatterometer, lidar, radar, synthetic aperture radar, altimeters. Present and future satellite surveillance systems.
Teaching methods and activities: Postponed/repeated exams may be oral.
Course materials: Books, compendium.

Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TTT4160 Mobile Communicatons

Lecturer: Professor Geir Egil Øien
Weekly hours: Spring: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The course gives an introduction in mobile communication systems with emphases on the Physical Layer and associated signal processing, propagation, propagation and important elements of the Medium Access Control (MAC) Layer.
Recommended previous knowledge: The background for TTT4160 Mobile Communication are basic course in Communications theory like TTT4115 and basic knowledge of digital signal processing like TTT4120. It is also an advantage to have a basic course in Digital Communications like TTT4130.
Academic content: A short introduction into mobile communications is given. The cellular concept is discussed. Multiplexing and duplexing methods are covered. Radio propagation is addressed and models for both large-scale and small-scale fading are presented. In this context an introduction into timevariant linear systems is given. Diversity principles are studied. Radio coverage and spectral efficiency of mobile communication systems are analyzed. A major part of the course is devoted to the physical layer of radio transmission techniques, such as modulation, coding, interleaving, and equalisation. As an example of a mobile communication system, the Global System for Mobile Communications (GSM) is presented and studied. Finally, the concept of mobile ad-hoc networks is introduced.
Teaching methods and activities: Lectures and exercises. If the exam is failed, the written exam may be replaced by an oral exam.
Course materials: Andrea Goldsmith: Wireless Communications, Cambridge Univ. Press, 2005.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TTT4175 Marine Acoustics

Lecturer: Professor Hefeng Dong
Weekly hours: Autumn: 4F+2Ø+6S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The objective is to give the foundation for the use of acoustical waves in water, starting with the development of the acoustic wave equation from basic principles. The emphasis is on sonar for localization and classification of objects, but also acoustics for communication and navigation underwater.
Required previous knowledge: None.
Recommended previous knowledge: Prerequisite knowledge: General background in mathematics and physics. Some familiarity with wave propagation problems and signal analysis. No prior knowledge of acoustics required.
Academic content: The course covers reflection and transmission at interfaces, wave propagation methods such as ray tracing techniques and normal mode theory. The theories for echo formation of simple targets and reverberation from volume and surfaces are discussed and empirical values are presented and discussed. The course is problem-oriented with focus on applications for detection and localization of objects. In this his context the role and design considerations for the major system elements are discussed such as transmitter, receiver, antenna and transducer technology and signal processing algorithms.
Teaching methods and activities: Class room lectures and computer assignments. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: Jens M. Hovem: Marine acoustics (In Press) Applied Research Laboratories, University of Texas, Austin, Texas, 2004, Chapter 1-11. The course material is available both in English and Norwegian.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	A

TTT4520 Signal Processing in Medical Applications, Specialization Project

Lecturer: Førsteamanuensis II Ilangko Balasingham
Weekly hours: Autumn: 24S = 15.0 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: Specialization projects in signal processing in medical applications.
The student shall make an in-depth study of a theme using scientific work methods. This involves the search for completing

material through litterature surveys and combining results from such with personal knowledge. The student shall learn to carry out a larger independent project. This includes project planning, reporting milestone results, and writing a final project report.
Recommended previous knowledge: For students in the study programmes Electronics and Communications Technology with main profile Signal Processing in Medical Applications.
Academic content: Technology development for novel algorithms and systems that find applications in medicine. The project can be modified depending on interest.
Teaching methods and activities: Individual projects with supervision.
Course materials: To be announced.
Assessment: Work

Forms of assessment	Date/Time	Percentage	Exam. support
EXCERCISES		100/100	

TTT4525 Signal Processing in Medical Applications, Specialization Course

Lecturer: Førsteamanuensis II Ilangko Balasingham
Weekly hours: Autumn: 12S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: Specialization knowledge in signal processing in medical applications.
Recommended previous knowledge: For students in the study programmes Electronics and Communications Technology with main profile Signal Processing in Medical Applications.
Academic content: The student shall choose two elective themes of 3,75 stp each or one elective theme of 7,5 stp. Possible themes are: Biomedical Image and Signal Processing and Communications, Digital Image Communication (3,75 stp), Communication and Coding Theory for Wireless Channels (3,75 stp), Signal Processing Techniques in Ultrasound Imaging - (3,75 stp), Statistical Signal Processing in Ultrasound Imaging - (3,75 stp), Ultrasound Transducers and Frontend Technology for Ultrasound Imaging - (3,75 stp), Medical Instrumentation - (3,75 stp), Acoustics Remote Sensing - (3,75 stp), Radar - (3,75 stp), Medical Sensors - (3,75 stp), Adaptive Filtering - (3,75 stp), Fusion of Sensor Data and Advanced Radar Concepts - (3,75 stp), 3D-Sound and Sound in Multimedia Applications - (3,75 stp).
Teaching methods and activities: The elective themes can be taught through lectures, seminars and self studies. In case of continuation exams, these will be arranged before the end of the same exam period. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: Will be announced at the beginning of the semester.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

Department of Hydraulic and Environmental Engineering

TVM4160 Material Flow Analysis

Lecturer: Professor Helge Brattebø
Weekly hours: Spring: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Assignments

Learning objectives: The course aims to give introductory understanding og MFA theory and methodology, and skills so that they can carry out simplified, but correct and good analyses, also using MFA software. Furthermore, students shall know about important applications of MFA, and understand the usefulness of MFA for development of good resource and environmental handling of material and waste flows in society.
Recommended previous knowledge: TVM4162 Industrial Ecology, or similar background, as well as basic mathematics (matrix algebra and differential equations).
Academic content: The course includes theory, methodology and examples from applying material flow analysis (MFA), which is a systematic assessment of flows and stocks of materials within a given system defined in space and time. A good documentation of material flows is a prerequisite for an optimum management of resources and environmental issues, including avoiding the risk of suboptimisation. The theoretical and methodological elements of the course include: i) material flow analysis in a historical perspective with respect to methodology and applications, ii) methodology, technical elements and software in material flow analysis (MFA) and substance flow analysis (SFA), and iii) dynamic analysis. Examples will include material flow analysis at the national, sectoral and local levels, and are related to typical problems in environmental and resource management, material flows in society's built environment, as well as in solid waste management and recycling systems.
Teaching methods and activities: Lectures and exercises. The course will be taught in English. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: Various course materials will be used and distributed electronically (It's learning) during the semester.

Assessment: Written examination/Work

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	50/100	D
EXCERCISES		50/100	

TVM4162 Industrial Ecology

Lecturer: Professor Helge Brattebø, Professor Sigurd Støren, Professor II Kjell Øren
Coordinator: Professor Helge Brattebø
Weekly hours: Autumn: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises in groups

Learning objectives: The course shall give students an overview knowledge of theory, analytical methodology and practical challenges in the field of industrial ecology. Emphasis is given to the understanding of how environmental assessment and improvements are carried out with support from systems analytical methods such as material flow analysis, risk analysis, life cycle analysis, energy analysis, costbenefit analysis and eco-efficiency analysis.
Recommended previous knowledge: None.
Academic content: Industrial ecology is the study of materials and energy flows i product systems and society, the environmental impacts of these flows, and the influence of technology and socio-economic factors. This course introduces strategies for and methods for quantitative analysis and implementation of industrial ecology, in four parts. Part A defines industrial ecology and presents the material and energy turnover in society. Part B presents the theoretical foundation for industrial ecology, including systems theory, thermodynamics and biology/ecology, and design principles in industrial ecology. Part C gives a thorough introduction to quantitative analytical methods, such as material flows analysis, risk assessment, energy and exergy analysis, life cycle analysis, input-output analysis, cost-benefit analysis, and eco-efficiency analysis. Part D covers problems and methods when implementing industrial ecology in policy, and in private and public sectors.
Students are trained in the use of quantitative analysis, in assignments and project work. Projects are especially prepared for students from Energy and Environment, Industrial Economics, Civil Engineering and Industrial Ecology.
Teaching methods and activities: Lectures, seminars and project work in interdisciplinary groups. The course is taught in English. Portfolio assessment is the basis for the grade in the course. The portfolio includes a final written exam (50%) and exercises (50%). The results for the parts are given in %-scores, while the entire portfolio is assigned a letter grade. Postponed/ repeated exams may be oral.
Course materials: Own developed course materials/textbook.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	50/100	D
EXCERCISES		50/100	

TVM4170 Systems Analysis for Built Environment

Lecturer: Post doktor Rolf André Bohne, Professor Helge Brattebø, Professor Per Jostein Hovde, Professor II Kjell Øren
Coordinator: Professor Helge Brattebø
Weekly hours: Autumn: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Assignments

Learning objectives: The course shall give a theoretical foundation and training in how to carry out systems analysis for built environment, especially as basis for strategies for sustainable infrastructure. The student shall develop skills in the use of analytical elements, methods and computer models for examining trends in the demand for buildings and infrastructure, lifetime, associated materials and energy flows, environmental impacts, life cycle costs, and system efficiencies.
Recommended previous knowledge: None.
Academic content: The course has three parts: a) Introduction to systems analysis for built environment, b) Elements and methods in the systems analysis, and c) Models, optimisation and strategies.
Part a) gives a description of the main features of systems analysis for built environment, and starts by explaining systems engineering in general and its relevance for systems analysis and improvements of built environment. Then, we cover development trends in society's demand for and construction of main components within built environment, i.e. different types of buildings and infrastructure, as well as critical factors with respect to sustainability in built environment.
Part b) emphasises the various elements in a systems and sustainability analysis for built environment; such as methods for calculation and simulation of material and energy demand and flows, emissions and environmental impacts, resource efficiencies, life cycle cost and cost/benefit.
Part c) covers holistic scenario, simulation and computermodels that can be used to examine development trends, optimisation and strategy evaluations, given the need for resource efficient and sustainable solutions for built environment.
Teaching methods and activities: Lectures, exercises and self studying. The teaching makes use of general theory and methodology, and is also linked to selected examples from different parts of built environment in practice. The lectures and

exercises are in English when students who do not speak Norwegian take the course. If there is a re-sit examination, the exam form may be changed from written to oral.
Course materials: Articles, reports and computer models, which will be made available on It'slearning during the course.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	70/100	D
EXCERCISES		30/100	

TVM5105 Hydrology for Hydropower, Basic Course

Lecturer: Førsteamanuensis Knut Alfredsen, Professor Ånund Killingtveit
Coordinator: Professor Ånund Killingtveit
Weekly hours: Autumn: 3F+4Ø+5S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises, Computer lab, Field work

Learning objectives: The course covers the basics in hydrology for civil engineers. The students should learn about methods for hydrological measurements, especially river flow where they should know both theoretical and practically the most important methods. Further the students should know the Rainfall-Runoff process, precipitation processes, the calculation of runoff by various methods, graphical and numerical flood analysis and principles for river and reservoir routing.
Recommended previous knowledge: Admission to the HPD MSc programme, admission to Civil and Environmental Engineeering or similar. The course is prerequisite for the TVM5130 Hydropower Project.
Academic content: Basic hydrology, applied hydrology and computational hydrology in the context of hydropower development.
Measurement of precipitation, evaporation and river flow. Hydrological processes from precipitation to runoff. Engineering applications of hydrology: Rainfall-Runoff analysis, Flood analysis, Reservoir and river Routing.
Teaching methods and activities: The lecturerers come from the university and the hydropower industry, all with international experience. Lectures and exercises are to a large extent integrated. All lectures and exercises are given in English. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: Elisabth Shaw: Hydrology in Practice.
Lecture notes.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TVM5115 Planning and Design of Dams, Basic Course

Lecturer: Professor Lars Olav Grande, Førsteamanuensis II Leif Lia, Professor Haakon Støle
Coordinator: Førsteamanuensis II Leif Lia
Weekly hours: Autumn: 4F+4Ø+4S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The course is offered in English to the students in the first year of the MSc programme Hydropower Development and third or fourth year of the siv.ing. studies in Civil and Environmental Engineering. The course covers the basic in dam engineering for civil engineers, including planning and design of concrete and embankment dams, soil mechanics for dams and concrete technology for dams. The students shall know the basic design and construction principles for various types of dams and be able to select type of dam and design and estimate the costs for a damsite after completion of the course.
Recommended previous knowledge: Admission to the HPD MSc programme, admission to Civil and Environmental Engineering or similar. The course is a prerequisite for TVM5130 Hydropower Project.
Academic content: Planning and design of dams in the context of hydropower development. The course covers the basics in dam engineering for civil engineers, including concrete and embankment dams, soil mechanics for dams and concrete technology for dams.
Teaching methods and activities: The lecturers come from the university and the hydropower industry, all with international experience. All lectures and exercises are given in English. The topic embankment dams will be addressed through a one week seminar during one of the two activity weeks during the semester. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: Books from the series "Hydropower Development" and supplementary lecture notes (English).
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TVM5125 Hydraulic Design, Basic Course

Lecturer: Professor II Odd Guttormsen, Professor Torbjørn Kristian Nielsen, Amanuensis Yngve Robertsen, Professor Haakon Støle
Coordinator: Professor Haakon Støle
Weekly hours: Autumn: 4F+4Ø+4S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The course is offered in English to the students in the first year in the MSc programme Hydropower Development and third or fourth year of the siv.ing. studies in Civil and Environmental Engineering. The students shall be able to plan and design hydraulic structures and waterways of a hydropower plant based on the content of the course.
Recommended previous knowledge: Admission to the HPD MSc programme, admission to Civil and Environmental Engineering or similar. The course is a prerequisite for the TVM5130 Hydropower Project.
Academic content: The course covers the basics in fluid mechanics, hydraulic design of dams and spillways, scour protection, fluvial sediment transport, turbines and surge tanks, hydraulic steel works and power house design.
Teaching methods and activities: The lecturers come from the university and the hydropower industry, all with international experience. Lectures and exercises are to a large extent integrated. All lectures and exercises are given in English. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: Books from the series "Hydropower Development" and supplementary lecture notes (English).
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TVM5130 Hydropower Plants, Project Work

Lecturer: Førsteamanuensis II Leif Lia, Professor Haakon Støle
Coordinator: Professor Haakon Støle
Weekly hours: Spring: 12Ø+12S = 15.0 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The students shall through the project work apply integrated hydropower planning methods. The students shall address technical, economic and environmental issues of a hydropower development of a river basin on a pre-feasibility level.
Recommended previous knowledge: The project work assumes completion of the basic courses: Dam Engineering, Geology and tunnelling, Hydrology for hydropower, Hydraulic design, Planning hydropower, Environment and economics.
Academic content: The project work covers a pre-feasibility (desk) study for an actual river system which is carried out in groups of 3-5 students.
Teaching methods and activities: Lectures covering project identification, the screening process etc. and supervision throughout the project period as required by the students will be given.
Course materials: Various relevant data such as topographic maps, hydrology data, geology maps, NVE’s data base on costs, etc.
Assessment: Work

Forms of assessment	Date/Time	Percentage	Exam. support
EXCERCISES		100/100	

TVM5135 The Planning Process of Hydropower Projects, Basic Course

Lecturer: Professor II Odd Guttormsen, Professor Haakon Støle
Coordinator: Professor Haakon Støle
Weekly hours: Autumn: 4F+4Ø+4S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The course is offered in English to the students in the first year in the MSc programme Hydropower Development and third or fourth year of the siv.ing. studies in Civil and Environmental Engineering. The course covers the main phases of a hydropower development project.
Recommended previous knowledge: Admission to the HPD MSc programme, admission to Civil and Environmental Engineering or similar. The course is a prerequisite for TVM5130 Hyropower Project.
Academic content: Organization and management of hydropower studies, implementation of hydropower and water resources projects, tender and contracts, construction management and small scale hydropower development.
Teaching methods and activities: The lecturers come from the university and the hydropower industry, all with international experience. Lectures and exercises are to a large extent integrated. All lectures and exercises are given in English. An excursion to various Norwegian hydropower plants are arranged during the first week of September. Some topics will be lectured as seminars over 3 to 5 days. This will be organized to avoid conflicts with the other courses in the HPD programme, i.e.

TVM5115, TVM5105 and TVM5125 wich are running in parallel with this course. If there is a re-sit examination, the examination form may be changed from written to oral.
Course materials: Books from the series "Hyropower Development" and supplementary lecture notes (English).
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

TVM5140 Environmental and Economic Assessment of Hydropower Projects, Basic Course

Lecturer: Professor II Odd Guttormsen, Professor Haakon Støle
Coordinator: Professor Haakon Støle
Weekly hours: Spring: 4F+4Ø+4S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Assignments

Learning objectives: The course is offered in English to the students in first year in the MSc programme Hydropower Development and third or fourth year of the siv.ing. studies in Civil and Environmental Engineering. The course covers environmental assessment and environmental mitigation measures for hydropower plants, basic economic analysis and the basis for technical-economical optimisation of hydropower plants for planners and project managers of hydropower projects.
Recommended previous knowledge: Admission to the HPD MSc programme, admission to Civil and Environmental Engineering or similar. The course is a prerequisite for TVM5130 Hydropower Project.
Academic content: Economic design criteria, investment and socio-economic analysis, environmental impact assessment studies and measures for mitigation of unfavourable environmental impacts.
Teaching methods and activities: Lecturers come from the university and the hydropower industry, all with international experience. All lectures and exercises are given in English. The lectures will be concentrated during the first half of the spring semester to prepare for TVM5130. Some topics will be lectured as seminars over 3 to 5 days. This will be organized to avoid conflicts with other course in the HPD programme.
Course materials: Books from the series "Hydropower Development" and supplementary lecture notes (English).
Assessment: Oral examination

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	100/100	D

TVM5150 Hydropower Simulation Models, Advanced Course

Lecturer: Førsteamanuensis Knut Alfredsen, Professor Ånund Killingtveit
Coordinator: Professor Ånund Killingtveit
Weekly hours: Autumn: 3F+4Ø+5S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises, Field work, Computer lab

Learning objectives: The course is offered in English to the students in the second year in the MSc programme Hydropower Development and to siv.ing.students in the study programme Civil and Environmental Engineering. The course objective is extended knowledge of computer and numerical model applications in river system studies.
Recommended previous knowledge: The course is based on TVM5105 Hydrology for Hydropower in the first year of the HPD-programme or TVM4105 Hydrology in Civil and Environmental Engineering.
Academic content: Discussion and application of the main computer models for river system analysis. Applied separately or integrated (River System Simulator).
Teaching methods and activities: Lectures, workshops, computer model applications, both as exercises and applied on actual rivers.
Course materials: Å. Killingtveit and N.R. Sælthun: Hydrologi. Articles, reports and computer model descriptions.
Assessment: Oral examination

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	100/100	D

TVM5160 Headworks and Sedimentation Engineering, Advanced Course

Lecturer: Professor Haakon Støle
Weekly hours: Autumn: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The course is offered in English to the students in the second year in the MSc programme Hydropower Development and to siv.ing. students in the study programme Civil and Environmental Engineering. The objective is to give a comprehensive basis for engineers who will be responsible for planning and design of the headworks of water resources projects in rivers loaded with sediments.
Required previous knowledge: The candidates must have some basic knowledge of river hydraulics and hydropower projects.

Recommended previous knowledge: The basic course TVM5125 Hydraulic Design and TVM5115 Dam Engineering in the first year of the HPD programme or TVM4116 Fluid Mechanics and preferably TVM4165 Hydro Power and Hydraulic Structures in the study programme Civil and Environmental Engineering.
Academic content: Sediment transport theory, the theory of physical hydraulic modelling and the use of water resources in sediment loaded rivers. Extended discussion on reservoir sedimentation, planning and design of headworks for run-of-river hydropower plants, sediment handling techniques, sediment sampling and analysis of sediment data.
Teaching methods and activities: Lectures, assignments and extensive laboratory exercises.
Course materials: Lysne, Glover, Støle and Tesaker: Hydraulic Design. Vanoni: Sedimentation Engineering. Støle: Withdrawal of Water from Himalayan Rivers and hand-out literature with supplementary articles, cases and lecture-notes (English).
Assessment: Oral examination

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	100/100	D

TVM5170 The Process of Social Impact Assessment, Advanced Course

Lecturer: Professor Haakon Støle
Weekly hours: Autumn: 5Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Assignments

Learning objectives: The course is offered in English to the students in the second year in the MSc programme Hydropower Development. The objectives are to improve the knowledge of the different stages of the process of socio-economic assessment, including strategic priorities and national guidelines, and to improve tools for planning projects in the best possible way on a national, regional and local level.
Recommended previous knowledge: The course ia based on TVM5140 Environmental and Economic Assessment of Hydropower in the first year of the MSc programme.
Academic content: The Internet based course consists of 13 modules, and one new module is presented every week. The course comprises: Background and development of SIA, impact assessment methodologies, baseline data and mitigation measures, stakeholder consultation process, health issues, education, training and gender issues, the role of NGOs and monitoring, resettlement, livelihood development, environmental and technical issues, institutional strengthening and capacity building, finance and budget issues, indigenous peoples and vulnerable groups.
Teaching methods and activities: The main core of the course is a distance-learning course on the Internet. The introduction to the course will be in a classroom setting and advisors will be available on a weekly basis in order to facilitate discussions and assistance to the students related to the weekly quiz or set of multiple-choice questions in each module and writes short reports. Evaluation will be based on each students workbook, containing all weekly reports etc. and an oral exam.
Course materials: All the course material is available for the participants on the Internet in English.
Assessment: Oral examination

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	100/100	D

TVM5175 Industrial Ecology, Project

Lecturer: NN
Weekly hours: Autumn: 12Ø+12S = 15.0 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The student shall through project work be trained in independent scientific work in industrial ecology, with focus on good formulation of working problems, application of methods, literature search and synthesis, as well as analysis and evaluation of results, where theory and practical problems are seen in combination, and to present such work in the form of a scientific article. The course shall also prepare for a good design of the forthcoming master thesis.
Recommended previous knowledge: It is recommended to have one year of study background from the MSc in Industrial Ecology programme at NTNU.
Academic content: The content of this course shall relate to a defined problem in the field of industrial ecology, in collaboration with the teacher. The course make use of theory and methodology from industrial ecology for the evaluation of environmental performance in technical systems, preferably in the waste management sector with respect to utilization of waste resources by recycling. The problem may be addressed by use of systems analysis methods, such as material flow analysis, life cycle analysis, or cost benefit analysis, and may well be connected to an external company.
Teaching methods and activities: Project work with tutoring, in combination with self studying. The project may be carried out individually or as group work, depending on the number of students. The language can be in English or Norwegian, according to preferences.
Course materials: To be defined together with the teacher, and in line with the nature of the project.

Assessment: Work

Forms of assessment	Date/Time	Percentage	Exam. support
EXCERCISES		100/100	

Faculty of Architecture and Fine Art

AAR4230 Planning and Construction in Developing Countries, Advanced Course

Lecturer: Professor Hans Christie Bjønness
Coordinator: Førsteamanuensis Hans Skotte
Weekly hours: Spring: 3F+1Ø+8S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The course is to give an introduction to basic preconditions and applicable knowledge for carrying out planning, infrastructure and construction activity on a sustainable basis in developing countries.
Recommended previous knowledge: None.
Academic content: Planning for sustainable development requires knowledge on a broad interdisciplinary basis. The course will discuss the basis for the theories and methods related to social and urban sustainable development, planning and construction activity. Environmental, socio-economic, physical and cultural factors need to be seen in context, as well as considering the different local conditions. There will be emphasis on cases that illustrate different conditions and institutional frameworks for the development and execution of cooperative development projects. Crisis planning for re-construction measures after disasters will also be included. An exercise is to be carried out with project documents according to UN template, and goal-based project planning as applied by NORAD (LFA).
Teaching methods and activities: The course is given in cooperation with several departments at the Faculty of Architecture and Fine Art, the Faculty of Engineering Science and Technology, and the Faculty of Social Science and Technology Management. Weight is placed on interdisciplinary seminars with introductory speakers from other faculties and specialists with experience in development-related issues. Case studies are presented and discussed. One exercise is to be carried out as group work.
Course materials: Compendium.
Assessment: Written examination/Work

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	75/100	C
PRACTICAL COURSE		25/100	

Department of Cancer Research and Molecular Medicin

MOL3000 Introduction to Molecular Medicine

Lecturer: Professor Hans Einar Krokan, Professor Marit Otterlei
Coordinator: Professor Marit Otterlei
Weekly hours: Autumn: = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Theoretical project assignment

Learning objectives: After having completed this course the students shall have obtained a basic understanding of molecular mechanisms in development of disease and how molecular/cellular biology may be used to characterise cellular processes.
Required previous knowledge: Bachelor degree in biology, biotechnology, biochemistry or bioengineering
Recommended previous knowledge: Basic knowledge in cell biology, biochemistry and molecular biology
Academic content: Basic concepts necessary to understand the human genome, gene expression and -regulation, genetic engineering, transcription and techniques used in recombinant DNA technology as well as basic principles of immunology will be discussed. These principles of molecular medicine will be linked to diagnosis and disease treatment. Articles/review articles will be obligatory reading.
Teaching methods and activities: Lectures and project assignment (theoretical)
Assessment: Assignment/Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	80/100	
ASSIGNMENT		20/100	

MOL3013 Molecular Physiology - Basic Course

Lecturer: Førsteamanuensis Ingunn Bakke, Professor Alf O Brubakk, Professor Terje Espevik, Professor Per Jynge, Professor Arne Kristian Sandvik, Forsker Liv Thommesen, Professor Helge Waldum
Coordinator: Professor Arne Kristian Sandvik

Weekly hours: Autumn: = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Participation in PBL exercises

Learning objectives: To understand molecular mechanisms involved in the integrated (physiological) regulation of organ function.
Required previous knowledge: Basic knowledge of molecular medicine.
Recommended previous knowledge: Basic knowledge of biochemistry, molecular medicine and molecular biology
Academic content: 2h Physiological principles. Homeostasis and regulation.
2h Extracellular signalling and pathways
2h Receptors and cell specific responses. Specificity, agonists and antagonists
2h Intracellular mediators in physiological regulation
2h Gene expression and physiological processes
2h Ion fluxes and organ function
2h Growth and regeneration in physiological and pathophysiological context.
Teaching methods and activities: Lectures. PBL sessions.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	

MOL4010 Molecular Biology for Technologists

Lecturer: Professor Berit Johansen, Prorektor Astrid Lægreid
Coordinator: Post doktor Torunn Bruland
Weekly hours: Spring: 3F+3Ø+6S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Participation at PBL exercises

Learning objectives: Course objectives:
The aim of the course is to provide technology students with a general introduction to biochemistry, molecular biology and genetics, so that they acquire an insight into how technology can be use within these fields.
Recommended previous knowledge: Recommended background knowledge:
2. year of civil engineering or equivalent education.
Academic content: Course description:
The course aims at providing the students with an introduction to the molecular mechanisms which are the foundations of biological processes in cells and organisms. An introduction to necessary biological background knowlegde will be given. Fundamental principles within molecular biology and genetics will also be covered. Ethical considerations connected with the use of gene technology will be discussed.
Teaching methods and activities: Teaching modalities:
Problem-based learning in groups, lectures and visit to a molecular biologic laboratory.
Course materials: Course literature:
Campell Biology 7. edition
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

MOL8002 Molecular Mechanisms of Host Defence

Lecturer: Professor Hans Einar Krokan
Weekly hours: Spring: = 9.0 Cr
Time: Teaching time and location will be announced on the web.
Grade: Pass/Fail Compulsory assignments: Seminars

Required previous knowledge: Masters degree in biology, chemistry, physics. Medical Doctors degree. Or medical students at The Student Research Programme. Candidates with other or lower degree will be assessed individually.
Recommended previous knowledge: Fundamental skills in medicine, cell biology, molecular biology at master degree level.
Academic content: Cell biology and molecular biology view of understanding cell growth and cell death, cell repair and maintenance. Basal immunological mechanisms in organisms. Description of cancer development on three levens: Molecular, cellular and organism.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	1/1	

MTEK3001 Applied Bioinformatics and Systems Biology
Lecturer: Professor Finn Drabløs
Weekly hours: Spring: 3F+3Ø+6S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The aim of the course is to give the students a basic introduction to applied bioinformatic methods, including principles from systems biology, making the students capable of applying relevant methods to their own problems.
Recommended previous knowledge: Basic knowledge in molecular biology corresponding to Molecular Biology for Technologists, statistics corresponding to Statistics with Applications and informatics corresponding to Information Technology, Introduction.
Academic content: The course aims at providing an introduction to the use of important methods in bioinformatics, including sequence library searches, pairwise and multiple alignment, phylogenetic analysis, gene prediction and structure prediction. The usage of these methods is also discussed in a systems biology context, and ontologies, large scale analysis and studies of complex systems will be discussed. The students will be able to test the methods on realistic problems through PC-based exercises. There will be emphasis on using an interdisciplinary approach during presentations and exercises, in order to make the course accessible to students in informatics as well as medicine and molecular biology.
Teaching methods and activities: Lectures and exercises (PC-lab). In case of postponed exam or few students, the exam can be changed from written to oral. The course will be given in English if necessary.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

Department of Circulation and Imaging

MFEL1010 Medicine for Non-Medical Students, Introduction
Lecturer: Førsteamanuensis Asbjørn Støylen
Weekly hours: Autumn: 3F+3Ø+6SSpring: 12S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Pass/Fail Compulsory assignments: 7 pbl exercises in both terms

Learning objectives: Course objective:
The aim of the course is to provide a general introduction to medicine to students who wish to apply their knowledge in projects within medicine. The course is particularly directed towards students within the fields of technology, informatics and administration, but will also serve as a perspective theme.
Recommended previous knowledge: No previous knowledge of medicine is necessary.
Academic content: The subject offers a general introduction to medicine. It deals with the anatomy and physiology of the body, from cell to organ. A number of common diseases like heart attack, cancer, stroke and chronic obstructive pulmonary disease, will be subject to more thorough treatment. Attention is drawn to how public healthcare is organized. Through the course students will also gain an insight into how patients are examined and treated when seeing a medical practitioner. The employment of technology is emphasized. Ethical dilemmas which might arise from the application of medical technology will be subject to discussion. The course gives 7,5 ECTS credits.
Teaching methods and activities: Lectures are only given in the autumn. They are held in Norwegian, but all lectures are available in English as films through It's learning. In addition all presentations are available as pdf-files at the same site.
7 compulsory PBL-assessments must be solved and delivered throught the internet.
Course materials: Seeley, Stephens Tate: Essentials of Anatomy and Physiology, 6th edition, (ISBN: 007110805X).
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	100/100	D

Department of Biology

BI2012 Cell Biology
Lecturer: Professor Tor-Henning Iversen
Weekly hours: Spring: 2F+4Ø = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments:

Learning objectives: On completion of the course the students should be familiar with cell organelles - their structure and functions.
Required previous knowledge: BI 1001/MNKBI101

Recommended previous knowledge: A basic knowledge in organic chemistry and biochemistry is recommended before taking the subject.
Academic content: The subject deals with cell organelles - their structure and functions. The semester assignment part of the disciplines presented in the lectures will be demonstrated through laboratory exercises. Students with a formal education in the field of bioengineering and with at least 2 years of practical experience in this field will be excused from taking the semester assignment. These types of students do not have to formally apply for the subject, but they should contact the teacher responsible for the subject in due time before the application for the exam in order to formalise the exception for taking the semester assignment.
Teaching methods and activities: Lectures: 20 hours.
Practicals/project: 30 hours.
Assessment: Assignment/Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	6/10	
ASSIGNMENT		4/10	

BI3013 Experimental Cell Biology

Lecturer: Professor Tor-Henning Iversen, Professor Berit Johansen
Coordinator: Professor Tor-Henning Iversen
Weekly hours: Autumn: 2F+4Ø = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: ,

Learning objectives: On completion of the course students should be familiar with basic methods in cell- and molecular biology. Students should also be able to demonstrate knowledge of how to use modern experimental techniques and instruments.
Academic content: The aim of the course is to introduce basic methods in cell- and molecular biology. The course includes practical exercises in modern experimental techniques and instruments, and also training in literature search and the use of Internet. Selected analytical methods will be presented and tested. The course also includes analyses of problems and artefacts that generally occur in biological samples examined using chemical and biological analyses.
Teaching methods and activities: Laboratory course/demonstrations: 35 hours, mandatory.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	1/1	

BI3016 Molecular Cell Biology

Lecturer: Professor Tor-Henning Iversen, Professor Berit Johansen
Coordinator: Professor Berit Johansen
Weekly hours: Autumn: 2F+2Ø = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments:

Learning objectives: On completion of the course students should have an understanding of cell biology mechanisms on a molecular level, and of the regulation of such mechanisms.
Academic content: On completion of the course students should have an understanding of cell biology mechanisms on a molecular level, and of the regulation of such mechanisms. Subjects covered include: Apoptose/necrose mechanisms; Kinases/ phosphatases classification and regulation; Transcription factors, classification and regulation; Lipid mediators, regulation and function mechanisms; DNA repair mechanisms. Syllabus will mainly be based on research- and review articles.
The course is obligatory for students on the master programme for cell and molecular biology, and students on the master programme for cell biology for medical technical staff.
Teaching methods and activities: Lectures: 26 hours
Seminar: 24 hours
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	1/1	

BI3018 Patenting and Commercialization of Biotech and Medtech Inventions

Lecturer: Professor Berit Johansen
Weekly hours: Spring: 2F+5Ø+5S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: How to develop an IP strategy to accelerate the innovationprocess and to safeguard IP investments, mastering freedom to operate in the Biotech/MedTech industry, Patent litigations, infringements and enforcements.

Recommended previous knowledge: Accepted as master student in Biology, Biotechnology, Chemistry, Medical technology, or PhD- students in Biology, Biotechnology, Chemistry, Medical technology or related areas.
Academic content: Patenting: Principles, process, national/international laws, regulations and practice, similarities/differences between European and US patenting laws and practise.
IPR strategies: Scientific/commercial aspects, how to develop an IP strategy to accelerate the innovationprocess and to safeguard IP investments, mastering freedom to operate in the Biotech/MedTech industry, Patent litigations, infringements and enforcements.
Licensin: Models and negotiation strategies.
Clinical testing: Design, implementation, analysis and presentation of clinical trials, adaptive clinical trialdesigns.
Bio-tech/Med-tech business development: Strategy and organization when transferring a scientific idea into a commercialproduct/business, business plan development, product pipeline analysis, market analysis, market potential prediction, alliance structures and negotiation conditions, capital capture(pre-seed, seed, VC).
Teaching methods and activities: Lecturers: Internationally highly recognized specialists from international patenting offices, pharmaindustry and entrepreneurial assistance company.
Course materials: Lecture notes and papers, articles handed out.
Assessment: Report

Forms of assessment	Date/Time	Percentage	Exam. support
REPORT		1/1	

BI3073 Genetic Toxicology

Lecturer: Førsteamanuensis Åse Krøkje
Weekly hours: Spring: 2F+2Ø = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments:

Learning objectives: On completion of the course the students should be familiar with methods and problem solving in genetic toxicology, and with how such methods can be used for studying the natural environment.
Required previous knowledge: BI 2012
Academic content: The course provides an introduction to problem solving and to basic methods in genetic toxicological research. A particular emphasis is put on methods suitable for studying the natural environment (Environmental genotoxicology).
Teaching methods and activities: Lectures: 10 hours
Seminar: 30 hours, mandatory
Assessment: Assignment/Oral examination

Forms of assessment	Date/Time	Percentage	Exam. support
REPORT		25/100	
ORAL EXAMINATION	To be announced on the web	75/100	

Department of Geography

GEOG3506 Geography, Health and Development

Lecturer: Førsteamanuensis Stig Halvard Jørgensen
Weekly hours: Autumn: 2F+1Ø+9S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Approved term paper and presentation

Learning objectives: The course aims to give a broad overview of geographical perspectives on health with two main focuses:
1) Health status, disease/injury and risk/risk factors.
2) Geography of health services at different levels, with emphasis on demand and use, availability and accessibility, prevention, and treatment.
Required previous knowledge: GEOG1000-1006 or the equivalent or bachelor degree in social sciences.
Recommended previous knowledge: See formal requirements.
Academic content: The main emphasis of the course is on the situation in developing countries, but more general development trends in health and health services in different parts of the world are also covered. As well as a common core curriculum, two in-depth courses (curriculum variations) are offered: one that studies developing countries' perspectives in more detail, and a guideline for studying westernized countries (among which Norway is central). The course covers studies in quantitative and qualitative method traditions.
Part of the study is based on students own reading which forms the foundation for carrying out the semester essay. This is presented at a seminar. A seminar is also arranged on searching for medical and health literature in libraries and databases (3 hours). The semester essay and presentation must be approved before the written examination can be taken.
Teaching methods and activities: Teaching method and activities: 20 hours lectures, 8 hours seminars.
Compulsory activity: Approved term paper and presentation.
Form of assessment: 4 hour written exam.

Course materials: Given at the start of the semester.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	1/1	C

GEOG3561 Gender and Social Change

Lecturer: Førsteamanuensis Cathrine Brun
Weekly hours: Autumn: 16F = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The course offers an introduction to the main themes of international social scientific research on gender, and provides a theoretical platform for further studies on gender-related issues.
Required previous knowledge: For Norwegian students: Bachelorgrad or "mellomfag" in Geography. Other relevant qualifications can be accepted if approved by the Department. For International students: Bachelor degree in social science.
Academic content: The course offers an introduction to the main themes of international social scientific research on gender, and provides a theoretical platform for further studies on gender-related issues. The course seeks to combine an interdisciplinary and subject-specific approach. It aims at outlining different perceptions of gender within different social scientific traditions. Theoretical and methodological problems related to the use of gender as an analytical category and how these are manifested in social scientific research are examined. The course also includes presentations of empirical material from gender-specific research within the field of geography and other social sciences.
Teaching methods and activities: Teaching method: 16 hours lectures and seminars with active involvement from students. Form of assessment: Written exam (4 hours).
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	1/1	

Department of Sociology and Political Science

POL1003 Environmental Politics

Lecturer: Førsteamanuensis Gunnar Fermann
Weekly hours: Spring: 2F+2Ø+8S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: To improve the students understanding of environmental politics at the national and international level.
Required previous knowledge: None.
Recommended previous knowledge: None.
Academic content: This course offers and introduction to the main theories and political processes within the field of environmental politics. The empirical focus will be on Norwegian environmental policy formation and implementation, but a few central international agreements and institutions will also be discussed. Theoretically, the emphasis will be on central theories of institutions, decision-making and collective action, which are often applied to understand the political processes of environmental policy formation.
Teaching methods and activities: Teaching methods and activities: Lectures 2 hours per week and seminars. The course has a compulsory term paper. The students may write the term paper in groups of up to 4 students. Size of term paper:up to 7500 words (up to 20 pages).
Forms of assessment: A 3 hours written exam and the term paper. Each part counts half of the grade. If you fail or want to re-take the exam, you have to re-take both parts.
Course materials: To be decided at the start of the course.
Assessment: Assignment/Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	1/2	
ASSIGNMENT		1/2	

POL1004 Globalization: Norway in International Society

Lecturer: Professor Jonathan Moses
Weekly hours: Autumn: 2F+2Ø+8S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Approved term paper

Learning objectives: To improve the students understanding of the main characteristics of economic, political and cultural globalization processes and how these affect the Norwegian economy, politics and culture.

Recommended previous knowledge: None.
Academic content: The students will be offered a short introduction to the literature on globalization within the fields of economy, political science and sociology. Theoretical and conceptual dilemmas associated with globalization will also be discussed.
Teaching methods and activities: Teaching methods and activities: 2 hours of lectures per week and supervison of project work.
Compulsory activity: Approved term paper (3000 words/8 pages).
Form of assessment: 3 hours written exam.
Course materials: To be decided at the start of the course.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN EXAMINATION	To be announced on the web	1/1	

POL3507 Policy Analysis

Lecturer: Førsteamanuensis Jon Arve Nervik
Weekly hours: Autumn: 4FSpring: 4F = 15.0 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Presentation

Learning objectives: To provide the students with the skills necessary to perform practical implementation and evaluation studies of public policy. The research paper will be formed as such a study.
Required previous knowledge: POL1002.
Recommended previous knowledge: See formal requirements.
Academic content: This course offers an introduction to theory and empirical research on the evaluation of public policy. Emphasis will be on the various approaches and methods applied to understand the content and effects of specific public policies. Theories and methods will be of an international character, but empirical examples will be from Norway.
Teaching methods and activities: Lectures/group discussions, 4 hours per week throughout the semester. Supervision of term paper.
Form of assessment: Term paper and oral examination. The oral exam covers the term paper as well as readings. The oral exam will be used to adjust the term papers grade by a maximum of one grade. The course is offered when teaching resources are available.
Course materials: To be decided at the start of the course.
Assessment: Assignment

Forms of assessment	Date/Time	Percentage	Exam. support
ASSIGNMENT		1/1	

Department of Economics

SØK1101 Environmental and Resource Economics

Lecturer: Professor Anders Skonhoft
Weekly hours: Spring: 2F+1Ø+9S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: One approved term paper.

Academic content: Ethics; how to assess economic goals and needs between generations? The notion of sustainable development. Environmental regulation - when and how? Optimal pollution control. Efficient utilisation of the environment. The theory on optimal management and use of renewable and non-renewable natural resources. Valuation of the environment. International environmental agreements.
Teaching methods and activities: Lectures and practical assignments. Compulsory activity: 1 approved term paper.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN	To be announced on the web	100/100	C

Interdisciplinary Teamwork (Experts in a Team)

Course description for Interdisciplinary Teamwork (Experts in a Team) will be announced on the web; www.ntnu.no/eit.

MASTER OF PHILOSOPHY IN ENGLISH LANGUAGE AND LINGUISTICS

The Department of Modern Foreign Languages offers an international master's programme in English Language and Linguistics. The aim of the programme is to give students a deeper insight into issues such as modern English grammar and syntax, communication studies, first and second language acquisition and translation theories.

Programme outline

The M.Phil. Programme requires two years of full-time studies, and starts in the autumn term (mid August). The normal workload for a full-time student for one academic year is 60 ECTS credits. The first year of the programme is devoted to a combination of courses, comprising a total of 60 ECTS credits. Of these at least 30 ECTS credits have to be from Master's level courses (courses with a 3000 code), but up to 30 credits may be obtained from advanced courses (courses with a 2000 code). Second year students are expected to work exclusively on their master's thesis, which also counts for a total of 60 ECTS credits. In the first year students may choose from the courses offered at the Department of Modern Foreign Languages or from courses offered by the Department of Language and Communcation Studies, and approved by the Department of Modern Foreign Languages.

Courses

Course code	Course title	ECTS credits	Semester	Restricted admission
ENG2153	First and Second Language Acquisition	7,5	Spring	
ENG2155	Theoretical and Practical Aspects of Grammar and Translation	7,5	Autumn	
SPRÅK3000	Theories and Methods in Linguistics	15	Autumn	
ENG3122	Cognitive and Theoretical Aspects of Language	15	Spring	
ENG3123	Translation	7,5	Spring	
ENG3910	Master's Thesis in English Language and Linguistics	60	Spring and autumn	*)
*) ENG3910: Requires admission to the study programme Master of Philosophy in English Language and Linguistics.				

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

Master of Philosophy in English Language and Linguistics

Semester	7.5 credits	7.5 credits	7.5 credits	7.5 credits
Spring 4	ENG3910 Master's Thesis in English Language and Linguistics			
Autumn 3				
Spring 2	ENG3122 Cognitive and Theoretical Aspects of Language		ENG3123 Translation	ENG2153 First and second language acquisition
Autumn 1	SPRÅK3000 Theories and Methods in Linguistics		LING2204 Pragmatics II	ENG2155 Theoretical and Practical Aspects of Grammar and Translation

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

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

Courses offered by the Department of Language and Communication Studies
The following courses offered by the Department of Language and Communication Studies have been approved for use in the M.Phil. in English Language and Linguistics degree. Note that topics may vary in the course marked by an asterisk (*). Students are advised to contact the Department of Modern Foreign Languages for details before registering for this course.

Course code	Course title	ECTS credits	Semester	Restricted admission
LING2204	Pragmatics II	7,5	Autumn	
LING2222	Language Typology	15	Autumn	
LING3001	Syntax and Semantics*	15	Autumn and Spring	

Teaching and exams
Normally each course has three hours of teaching per week in the form of lectures and seminars. Some individual supervision may be offered. Assessment in the ENG-courses is based on a written assignment. In addition, students are required to give oral presentations and/or complete course projects. Methods of assessment in the LING-courses vary from course to course. For more information, see the course descriptions on the web.

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

By the end of the second semester at the master's programme, students must hand in a project proposal for their master's thesis. The project proposal is written in agreement with a potential supervisor. The project description serves as a basis for the Head of Department's approval of an agreement on supervision between a student and a supervisor.

Field-work
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 theses. Students who are supported by the Quota Programme are awarded an extra grant to cover field-trip expenses.

Admission 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 three English language/linguistics courses will be considered for acceptance.

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.

Course descriptions

ENG2153 First and Second Language Acquisition

Teaching: Spring: 7.50 Cr
Language of instruction: English
Grade: Letter grade
Compulsory assignments: Oral presentation, approx. 20 minutes
Recommended previous knowledge: ENG1101 or equivalent approved course.
Required previous knowledge: None
Learning objectives: To achieve an awareness of the basic issues of L1 and L2 acquisition and to be able to practically employ this knowledge.
Academic content: The course provides an introduction to First and Second language (L1 L2) acquisition with a special focus on how theoretical knowledge of these phenomena can be employed in improving the methods for L2 instruction and for practical purposes in education and language teaching otherwise.
Course materials: Curriculum/reading list will be announced at the beginning of the semester.
Teaching methods and activities: Seminars, discussions and individual supervision. Assessment: Home exam approx. 2500 words/5-6 pages.
Assessment: Home examination

Forms of assessment	Time	Percentage	Deadline
HOME EXAMINATION	10.0 Days	1/1	

ENG2155 Theoretical and Practical Issues of English Grammar and Translation

Teaching: Autumn: 7.50 Cr
Language of instruction: English
Credit reduction: ENG2152: 7.50 Cr, HFENG235: 7.50 Cr
Grade: Letter grade
Compulsory assignments: 4 written assignments, each approx. 500 words/1-2 pages
Recommended previous knowledge: ENG1101 and ENG1201 or equivalent
Required previous knowledge: None
Learning objectives: To achieve an awareness of the basic issues of the grammar of English and ways of describing and explaining them using advanced theoretical approaches. To gain an understanding of how awareness of parametric variation in grammar can be employed to resolve issues in translation.
Academic content: The course provides an in-depth study of selected phenomena in English grammar from the point of view of state-of-the-art frameworks and approaches. In addition, the parametric variation displayed in English and Norwegian is addressed from the point of view of translation theory and practice.
Course materials: Curriculum/reading list will be available at the beginning of the semester.
Teaching methods and activities: Seminars, discussions and individual supervision. Compulsory assignments: Short assignments that must be submitted on time during the course. Assessment: Home exam approx. 2500 words/5-6 pages.
Assessment: Home examination

Forms of assessment	Time	Percentage	Deadline
HOME EXAMINATION	10.0 Days	1/1	

SPRÅK3000 Theories and Methods in Linguistics

Teaching: Autumn: 15.0 Cr
Language of instruction: English, French, Norwegian, German
Credit reduction: NORD3101
Grade: Letter grade
Compulsory assignments: Approved reading list, 1 written assignment (3-5p) in the subject based component
Recommended previous knowledge: Bachelor's degree with specialization in nordic languages, English, French or German, or introductory courses in linguistics.
Required previous knowledge: None
Learning objectives: The course gives students a theoretical basis for working academically with linguistic issues. Students are expected to gain insight into fundamental research issues, as well as into modern linguistic theories, and they will develop the ability to relate these to problems and data within their field of study.
Academic content: The course enters into the following master's programmes: English, French, German and Nordic. It is also a component in the bachelor's specialization in linguistics.
The course has one core component common for all students and one subject-based component. The core component covers research theories as well as some central frameworks, theories and/or disciplines in linguistics, for example generative grammar,

sociolinguistics, language and cognition, language acquisition, pragmatics. In the subject-based component one or more linguistic disciplines will be studied in more detail.
Course materials: Required reading for the common component comprises 400-450 pages. These texts are primarily in Norwegian (Scandinavian) or English, and the teaching is in Norwegian or English. Required reading for the subject based component will vary depending on the character and difficulty of the texts. These texts are primarily in the language of study for students at the master's programmes in English, French and German, whereas they may be in Norwegian/Scandinavian for other students. A suggested reading list will be available at the beginning of the semester.
Teaching methods and activities: Lectures and seminars.
Obligatory activities: There is 1 written assignment, 3-5 p, in the subject-based component. Students at the master's programmes in English, French and German must write the assignment in the language of study.
Assessment: Home exam, approx. 10-12 p. Students at the master's programmes in English, French and German must answer questions concerning the subject-based component in the langage of study.
Assessment: Home examination

Forms of assessment	Time	Percentage	Deadline
HOME EXAMINATION	2.0 Weeks	1/1	

ENG3122 Cognitive and Theoretical Aspects of Language
Teaching: Spring: 15.0 Cr
Language of instruction: English
Credit reduction: ENG3112: 15.0 Cr
Grade: Letter grade
Compulsory assignments: Oral presentation, approx. 20 minutes
Recommended previous knowledge: Undergraduate language and linguistic courses.
Required previous knowledge: None
Learning objectives: Students should gain understanding of central theories of language and how these can be explained in light of recent cognitive models.
Academic content: The course addresses language from the point of view of contemporary linguistic theory and cognitive science. Central issues of the cognitive make-up of language are addressed based in data from Modern English, with a focus on how successful the approaches discussed are at explaining the basic facts and properties of natural languages.
Course materials: The reading list will be available at the beginning of the semester.
Teaching methods and activities: Lectures/seminars. Assessment: Home exam approx. 4000 words/10-12 pages.
Assessment: Home examination

Forms of assessment	Time	Percentage	Deadline
HOME EXAMINATION	10.0 Days	1/1	

ENG3123 Translation
Teaching: Spring: 7.50 Cr
Language of instruction: English
Grade: Letter grade
Compulsory assignments: Oral presentation, approx. 20 minutes
Recommended previous knowledge: Bachelor's Degree with specialisation in English or Bachelor's degree in European studies and foreign languages.
Required previous knowledge: None
Learning objectives: To develop an awareness of central issues in translation both as a linguistic enterprise and as cultural practice.
Academic content: The course will focus on issues of translation from an interdiciplinary perspective. Both translation theory advances and semiotic approaches will be discussed. A central issue addressed in the course is the notion of equivalence across languages.
Course materials: The reading list will be available at the beginning of the semester.
Teaching methods and activities: Lectures/seminars. The course may be offered in
collaboration with the Department of Scandinavian Studies and Comparative Literature and the Department of Language and Communication Studies. Assessment: Home exam approx. 2500 words/5-6 pages.
Assessment: Home examination

Forms of assessment	Time	Percentage	Deadline
HOME EXAMINATION	10.0 Days	1/1	

LING2204 Pragmatics II
Teaching: Autumn: 7.50 Cr
Language of instruction: English, Norwegian
Credit reduction: HFLING206: 7.50 Cr, HFLING206A: 7.50 Cr
Grade: Letter grade
Compulsory assignments: 3 approved exercises with supervision
Recommended previous knowledge: LING1104 Pragmatics I.

Learning objectives: The objective is to enable the students to read original literature on pragmatic topics and to base their work with the term paper on what they have read and understood.
Academic content: This course offers an introduction to pragmatic theory with an emphasis on relevance theory. Central topics are the relationship between semantics and pragmatics, the relationship between truth-functional and non-truth-functional content, the relationship between explicit and implicit communication and the relation between descriptive and interpretative language use.
Teaching methods and activities: Lectures and group instructions.
More on assessment: Obligatory exercises must be approved before students are allowed to take the take-home exam. The size of the exercises must be between 8-12 typed A4-pages each (line spacing 1.5).
The size of the take-home exam depends partly on the subject, but is usually between 8-15 typed A4-pages (line spacing 1.5).
Assessment: Home examination

Forms of assessment	Time	Percentage	Deadline
HOME EXAMINATION	1.0 Weeks	1/1	

LING2222 Language Typology

Teaching: Autumn: 15.0 Cr
Language of instruction: English, Norwegian
Credit reduction: HFLING214: 15.0 Cr, HFLING214A: 15.0 Cr
Grade: Letter grade
Compulsory assignments: 3 approved exercises with supervision
Recommended previous knowledge: LING1102 Phonology I, LING1103 Semantics I and LING2201 Syntax II
Learning objectives: The objective is that the students get an understanding of how the morpho-syntactic construction of languages can vary typologically, and at the same time learn how grammar formalisms can be built up to reflect these variations.
Academic content: This course offers an introduction to typological traits used in the classification and analysis of the world's languages. These traits may be of a morphological, syntatic, semantic, pragmatic or phonological character, and various language areas may be emphasized. The course also teaches students to work with formal frameworks (such as LFG, HPSG) in relation to languages that contain radically different properties from what the frameworks are originally based on.
Teaching methods and activities: Lectures and group instructions.
More on assessment: Obligatory exercises must be approved before students are allowed to take the exam. The size of the exercises must be between 6-10 typed A4-pages each (line spacing 1.5). The size of the take-home exam depends partly on the subject, but is usually between 10-30 typed A4-pages (line spacing 1.5).
Assessment: Home examination

Forms of assessment	Time	Percentage	Deadline
HOME EXAMINATION	2.0 Weeks	1/1	

LING3001 Syntax and Semantics

Teaching: Both autumn and spring: 15.0 Cr
Language of instruction: English, Norwegian
Credit reduction: HFLING301: 15.0 Cr
Grade: Letter grade
Compulsory assignments: 3 approved exercises with supervision
Recommended previous knowledge: Bachelor's degree with a Major in Linguistics, LING2201 Syntax II and LING2203 Semantics II.
Learning objectives: The objective is that the students get a sufficiently thorough introduction to a syntactic or semantic field such that they will be able to independently perform thorough studies within the field.
Academic content: This course offes a deeper introduction to fields treated in Syntax II, Language Typology or Sematics II. Topics discussed will vary from semester to semester.
Teaching methods and activities: Lectures and group instructions.
More on assessment: Obligatory exercises must be approved before students are allowed to hand in the term paper. The size of the exercises must be between 10-20 typed A4-pages each (line spacing 1.5). The size of the term paper depends partly on the subject, but is usually between 15-30 typed A4-pages (line spacing 1.5).
Assessment: Assignment

Forms of assessment	Time	Percentage	Deadline
ASSIGNMENT		1/1	

ENG3910 Master´s Thesis in English Language and Linguistics

Teaching: 1st sem. autumn, 2nd sem. spring: 60.0 Cr
Language of instruction: English
Credit reduction: HFENG391: 60.0 Cr
Grade: Letter grade
Compulsory assignments: None

Required previous knowledge: Requires admission to the study programme, as well as a completed bachelor's degree in English language or in Linguistics, or equivalent approved education. Only candidates with a minimum of three English language/ linguistics courses will be considered.
Learning objectives: The student should be able to treat a specialized topic within English language and/or lingusitics in an academic way, and present the results in English.
Academic content: An academic work of approximately 30 000 words/ 80 pages (1,5 lines spacing) on a topic within English language and/or linguistics. The thesis must be written in English.
Teaching methods and activities: Individual supervision. The grade given on the thesis may be adjusted after the oral exam (approx. 30 minutes).
Assessment: Thesis

Forms of assessment	Time	Percentage	Deadline
THESIS		1/1	

MASTER OF PHILOSOPHY (M.PHIL.) IN MARITIME ARCHAEOLOGY

The degree is also known as the 'International M. Phil. in Archaeology'.

Admission requirements

Applicants should hold a B.A. or an equivalent degree in Archaeology, or an equivalent degree with a sufficient emphasis on topics related to Archaeology. Candidates with an equivalent B.A. degree in Arts/Social Sciences and other relevant subjects (e.g. Geology, Geophysics, Marine Technology or Oceanography) can also apply, if the candidate has completed a satisfactory number of courses in Archaeology. Candidates must have completed at least 20 ECTS credits (studiepoeng) of basic courses in Archaeology from NTNU, or equivalent courses (at least 1/3 of one year of full-time study). Officially certified copies of all educational certificates, including transcripts and diplomas from secondary school and university, must be submitted.

An English proficiency test certificate must be included. Applicants must pass either the TOEFL with a minimum paper score of 550 (230 computer) or the IELTS with a grade of 6.0 or better. Citizens from 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 have attended higher secondary school or university during this time. 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 language 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 for which the language of instruction has been English are not exempted from the English language requirements, with the exception of candidates holding a B.A. degree in English.

Norwegian applicants to the international master’s programmes must have passed the required exam in English language (“Engelsk grunnkurs”) in the Norwegian Higher Secondary School system. Applicants from European or other industrialised countries which have ratified the Lisbon Convention, should document a minimum of seven years of English as a subject at primary and secondary school level when submitting the final application form. Applicants from some of these countries, who have less than seven years of English from primary and secondary school, must however satisfy the English test requirements (TOEFL/IELTS test with satisfactory score) mentioned above.

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

The M.Phil. programme in Maritime Archaeology focuses on the following topics:

- Maritime Aspects of Culture: the development and scope of the subject, current research, theoretical perspectives and central issues.
- Comparative Perspectives on Maritime Cultural Landscape: interaction between land and sea in the cultural development of the world.
- Boat and Shipbuilding Technologies: materials and techniques of construction, and the major building traditions of the world, with focus on certain periods. Our main focus will be on current research projects.
- Ship Science in Archaeology: recording, reconstruction and analysis of ancient hulls.
- Seafaring in the World; covering seafaring, navigation, anchorages, harbours, trade and exchange.
- Marine Natural Resources in cultural development from a world comparative perspective.
- Underwater Cultural Heritage Management: deals with the priorities of assessing, protecting and managing underwater archaeological resources.
- Archaeological Oceanography.
- Underwater Archaeology: the application of archaeological principles in underwater environments, and associated skills – including marine archaeological field methods.
- Deep-Water Archaeology: a study program in deep-water archaeology including the use of technology and methods developed at NTNU.
- Conservation of Underwater Archaeological sites.

Course outline

The M.Phil. Programme requires two years of full-time study, and starts in the autumn term. The credits are divided between courses comprising a total of 60 credits and a thesis of 60 credits. 60 credits constitutes the normal workload for a full-time student for one academic year.

M.Phil. in Maritime Archaeology

Semester	**7,5 ECTS credits**	**7,5 ECTS credits**	**7,5 ECTS credits**	**7,5 ECTS credits**
4 Spring	ARK3095 MPhil Master's Thesis Seminar			
3 Autumn	ARK3040 Management of maritime Heritage	ARK3050 Maritime archaeological Science	ARK3095 MPhil Master's Thesis Seminar	
2 Spring	ARK3015 Maritime Culture II	ARK3025 Maritime archaeological Field Research II	ARK3030 Archaeological Oceanography	ARK3095 MPhil Master's Thesis Seminar
1 Autumn	ARK3010 Maritime Culture I		ARK3020 Maritime archaeological Field Research I	ARK3095 MPhil Master's Thesis Seminar

Teaching and exams

Each course has a take-home exam. Normally each 15 credit course has four hours of teaching per week in the form of lectures and seminars.

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

Course descriptions

ARK3010 Maritime Culture I
Teaching: Autumn: 15.0 Cr
Language of instruction: English
Grade: Letter grade
Compulsory assignments: Lectures, seminars.
Recommended previous knowledge: Bachelor degree in Archaeology.
Required previous knowledge: None.
Learning objectives: The student will develop insights into central problems and research subjects of maritime archaeology, and obtain fundamental knowledge of maritime cultures in a comparative perspective.
Academic content: - Development and scope of maritime archaeology, current research, theoretical perspectives and central issues. - Maritime archaeology in modern society. - Maritime cultural landscape. - Boat and shipbuilding technologies.
Course materials: The required reading list will be available at the beginning of the semester. Students are not allowed to consult any text-books during the 6 hour exam.
Teaching methods and activities: In order to be able to sit the final exam, the student must participate in a minimum of 70 percent of all obligatory activities (lectures and seminars).
Assessment: Written examination

Forms of assessment	Time	Percentage	Deadline
WRITTEN	6.0 Hours	1/1	

ARK3015 Maritime Culture II
Teaching: Spring: 7.50 Cr
Language of instruction: English
Grade: Letter grade
Compulsory assignments: Lectures, seminars.
Recommended previous knowledge: ARK 3010 Maritime Culture I.
Required previous knowledge: None.

Learning objectives: This course is a follow-up (continuation)of Maritime Culture I. Students will achieve more detailed knowledge on such central themes as shipping, maritime resources, and maritime symbolism.
Academic content: - Seafaring and maritime infrastructures of the world. - Marine natural resources and cultural development. - Maritime symbolism.
Course materials: The required reading list will be available at the beginning of the semester. Students are not allowed to consult any text-books during the 6 hour exam.
Teaching methods and activities: In order to be able to sit the final exam, the student must participate in a minimum of 70 percent of all obligatory activities (lectures and seminars).
Assessment: Written examination

Forms of assessment	Time	Percentage	Deadline
WRITTEN	6.0 Hours	1/1	

ARK3020 Maritime Archaeological Field Research I

Teaching: Autumn: 7.50 Cr
Language of instruction: English
Grade: Letter grade
Compulsory assignments: Lectures, seminars.
Recommended previous knowledge: Bachelor degree in archaeology.
Required previous knowledge: None.
Learning objectives: Achieve basic knowledge of maritime archaeological methods on land and under water.
Academic content: Maritime archaeological methods on land and under water including application of archaeological principles in underwater environments and associated skills.
Course materials: The required reading list will be available at the beginning of the semester. Students are not allowed to consult any text-books during the 6 hour exam.
Teaching methods and activities: In order to be able to sit the final exam, the student must participate in a minimum of 70 percent of all obligatory activities (lectures and seminars).
Assessment: Written examination

Forms of assessment	Time	Percentage	Deadline
WRITTEN	6.0 Hours	1/1	

ARK3025 Maritime Archaeological Field Research II

Teaching: Spring: 7.50 Cr
Language of instruction: English
Grade: Letter grade
Compulsory assignments: Lectures, seminars.
Recommended previous knowledge: ARK 3020 Maritime Archaeological Field Research I.
Required previous knowledge: None.
Learning objectives: This subject has its basis in ARK 3020 Maritime Archaeological Field Research I. Students will develop a broader knowledge on field methods of maritime archaeology.
Academic content: - Marine technology. - Deep water archaeology. - Remote sensing and investigations - implications for archaeology.
Course materials: The required reading list will be available at the beginning of the semester. Students are not allowed to consult any text-books during the 6 hour exam.
Teaching methods and activities: In order to be able to sit the final exam, the student must participate in a minimum of 70 percent of all obligatory activities (lectures and seminars).
Assessment: Written examination

Forms of assessment	Time	Percentage	Deadline
WRITTEN	6.0 Hours	1/1	

ARK3030 Archaeological Oceanography

Teaching: Spring: 7.50 Cr
Language of instruction: English
Grade: Letter grade
Compulsory assignments: Lectures, seminars.
Recommended previous knowledge: Bachelor degree in archaeology.
Required previous knowledge: None.
Learning objectives: Students will develop knowledge on central oceanographic problems and their implications for research within maritime archaeology.
Academic content: - Physics, chemistry and biology of the oceans. - Sedimentation and cultural heritage. - Obstruction processes and implications for archaeology.
Course materials: The required reading list will be available at the beginning of the semester. Students are not allowed to consult any text-books during the 6 hour exam.

Teaching methods and activities: In order to be able to sit the final exam, the student must participate in a minimum of 70 percent of all obligatory activities (lectures and seminars).
Assessment: Written examination

Forms of assessment	Time	Percentage	Deadline
WRITTEN	6.0 Hours	1/1	

ARK3040 Management of Maritime Heritage

Teaching: Autumn: 7.50 Cr
Language of instruction: English
Grade: Letter grade
Compulsory assignments: Lectures, seminars.
Recommended previous knowledge: Bachelor degree in archaeology.
Required previous knowledge: None.
Learning objectives: Students will develop knowledge on national and international systems for protection of maritime archaeological heritage and relationship between heritage management systems and the public.
Academic content: - National and international management systems. - Maritime heritage and the public.
Course materials: The required reading list will be available at the beginning of the semester. Students are not allowed to consult any text-books during the 6 hour exam.
Teaching methods and activities: In order to be able to sit the final exam, the student must participate in a minimum of 70 percent of all obligatory activities (lectures and seminars).
Assessment: Written examination

Forms of assessment	Time	Percentage	Deadline
WRITTEN	6.0 Hours	1/1	

ARK3050 Maritime Archaeological Science

Teaching: Autumn: 7.50 Cr
Language of instruction: English
Grade: Letter grade
Compulsory assignments: Lectures, seminars.
Recommended previous knowledge: Bachelor degree in archaeology.
Required previous knowledge: None.
Learning objectives: Students will develop detailed knowledge on application of natural sciences methods within research and maritime archaeological sites and artifacts.
Academic content: - Preservation. - Dating. - Measurements and reconstructions.
Course materials: The required reading list will be available at the beginning of the semester. Students are not allowed to consult any text-books during the 6 hour exam.
Teaching methods and activities: In order to be able to sit the final exam, the student must participate in a minimum of 70 percent of all obligatory activities (lectures and seminars).
Assessment: Written examination

Forms of assessment	Time	Percentage	Deadline
WRITTEN	6.0 Hours	1/1	

ARK3095 M. Phil. Master’s Thesis

Teaching: Both autumn and spring: 60.0 Cr
Grade: Letter grade
Compulsory assignments: ,
Required previous knowledge: Admission to the MPhil-programme in Maritime Archaeology is required.
Learning objectives: Students should learn to perform an archaeological analysis and develop and write an academic paper.
Academic content: The course covers the development of a project description, and on the basis of this, the writing of a Master’s thesis. The topic for the thesis is chosen in collaboration with the department, usually within one of the department?s project programmes. The thesis should be the equivalent of two semesters’ workload. It should be 60-80 pages long, A4 format, with 2.5cm margins, 1.5 line spacing and 12 point Times New Roman font (approximately 21,000-28,000 words). The table of contents, illustrations, acknowledgements, literature list and a possible appendix are counted in addition to this. If the length of the thesis significantly exceeds the norm, it will have to be approved by the advisor.
Teaching methods and activities: Participation requires acceptation into the MPhil programme in Maritime Archaeology. Assessment form: A grade evaluation of the Master’s thesis in combination with an oral examination. The oral exam will consist of the student?s presentation of the thesis, followed by a discussion of the thesis between the censors and the student. A preliminary grade is set on the basis of the written work. The oral exam can be used to adjust the final grade. In order to be able to sit the final exam, the student must participate in a minimum of 70 percent of all obligatory activities.
Assessment: Thesis

Forms of assessment	Time	Percentage	Deadline
THESIS		1/1	

MASTER OF PHILOSOPHY (M.PHIL.) IN LINGUISTICS

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.

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 represents the normal workload for a full-time student for one academic year. The 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 15 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
LING2201	Syntax II	7.5	Spring	
LING2202	Phonology II	7.5	Autumn	
LING2203	Semantics II	7.5	Spring *)	
LING2204	Pragmatics II	7.5	Autumn	
LING2206	Computational Linguistics I	7.5	Spring	
LING2207	Grammar Engineering I	7.5	Spring *)	
LING2216	Computational Linguistics II	7.5	Autumn	
LING2217	Grammar Engineering II	7,5	Spring *)	
LING2221	Intonation	15	Autumn *)	
LING2222	Language Typology	15	Autumn	
LING3001	Syntax and Semantics	15	Autumn and Spring *)	
LING3003	Pragmatics III	15	Spring *)	
LING3005	Grammar Engineering III	15	Autumn *)	
LING3006	Phonology III	15	Spring *)	
LING3392	M.Phil. Thesis in Linguistics	45	Autumn and Spring	**)
*) The courses offered may vary. Contact the department for more information prior to semester start.				
**) 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 topics may be admitted in the degree. More information about the topics is to be found in the respective curricula.

Course code	Course title	ECTS credits	Semester	Restricted admission
FON1101	Introduction to Phonetics	15	Autumn	
FON2205	Transcription	7.5	Autumn/Spring	
ENG2153	First and Second Language Acquisition	7.5	Spring	
ENG3122	Cognitive and Theoretical Aspects of Language	15	Spring	

M.Phil. in Linguistics: Example with emphasis on grammar and pragmatics

Semester	7,5 ECTS credits	7,5 ECTS credits	7,5 ECTS credits	7,5 ECTS credits
Spring 4	LING3392 M.Phil Thesis			
Autumn 3	LING3392 M.Phil Thesis		LING3001 Syntax and Semantics	
Spring 2	LING2201 Syntax II	LING2203 Semantics II	LING3003 Pragmatics III	
Autumn 1	LING2202 Phonology II	LING2204 Pragmatics II	LING2222 Language Typology	

M.Phil. in Linguistics: Example with emphasis on phonology and pragmatics

Semester	7,5 ECTS credits	7,5 ECTS credits	7,5 ECTS credits	7,5 ECTS credits
Spring 4	LING3392 M.Phil Thesis			
Autumn 3	LING3392 M.Phil Thesis		LING3006 Phonology III	
Spring 2	LING3003 Pragmatics III		LING3001 Syntax and Semantics	
Autumn 1	LING2202 Phonology II	LING2204 Pragmatics II	LING2222 Language Typology	

M.Phil. in Linguistics: Example with emphasis on syntax and semantics

Semester	7,5 ECTS credits	7,5 ECTS credits	7,5 ECTS credits	7,5 ECTS credits
Spring 4	LING3392 M.Phil Thesis			
Autumn 3	LING3392 M.Phil Thesis		LING3001 Syntax and Semantics	
Spring 2	LING2217 Grammar Engineering II	LING2203 Semantics II	LING2207 Grammar Engineering I	LING2201 Syntax II
Autumn 1	LING2202 Phonology II	LING2204 Pragmatics II	LING2222 Language Typology	

Teaching and exams

Each course, whether intermediate or master's, has a home exam, (one week for 7.5 ECTS credits and two weeks for 15 ECTS credits). Normally each 15 ECTS credit course has four hours of teaching per week in the form of lectures and seminars.

After the first year of study, during the period mid June to mid August, the candidates are given the opportunity to return to their home countries to do fieldwork if this is necessary for the completion of

their theses. Students who are supported by the Quota programme are awarded an extra grant to cover field-trip expenses.

Course descriptions

LING2201 Syntax II

Teaching: Spring: 7.50 Cr
Language of instruction: English, Norwegian
Credit reduction: HFLING203: 7.50 Cr, HFLING203A: 7.50 Cr
Grade: Letter grade
Compulsory assignments: 3 approved exercises with supervision
Recommended previous knowledge: LING1101 Syntax I.
Learning objectives: The objective is that the students actively can apply a formal syntactic theory, regardless of the typological classification of the languages described.
Academic content: Course instruction is based on the frameworks Head-Driven Phrase Structure Grammar (HPSG) and Lexical Functional Grammar (LFG). The course offers an introduction to the use of computational platforms adjusted to these two frameworks.
Course materials: Will be announced at the beginning of the semester.
Teaching methods and activities: Lectures and group instructions.
More on assessment: Obligatory exercises must be approved before students are allowed to take the take-home exam. The size of the exercises must be between 6-10 typed A4-pages each (line spacing 1.5). The size of the take-home exam depends partly on the subject, but is usually between 8-15 typed A4-pages (line spacing 1.5).
Assessment: Home examination

Forms of assessment	Time	Percentage	Deadline
HOME EXAMINATION	1.0 Weeks	1/1	

LING2202 Phonology II

Teaching: Autumn: 7.50 Cr
Language of instruction: English, Norwegian
Credit reduction: HFLING204: 7.50 Cr, HFLING204A: 7.50 Cr
Grade: Letter grade
Compulsory assignments: 3 approved exercises with supervision
Recommended previous knowledge: LING1102 Phonology I.
Learning objectives: The objective is to give the students insight in the use of phonological models, so that they can analyse phonological data from their native language in accordance with the chosen model.
Academic content: This course continues the department's introduction to phonology with special emphasis on the presumed universal traits of syllable and sound structures. The most current models of phonological analysis will be used. The relationship between phonological form and its phonetic realization is central to the coursework.
Teaching methods and activities: Lectures and group instructions.
More on assessment: Obligatory exercises must be approved before students are allowed to take the take-home exam. The size of the exercises must be between 8-12 typed A4-pages each (line spacing 1.5).
The size of the take-home exam depends partly on the subject, but is usually between 8-15 typed A4-pages (line spacing 1.5).
Assessment: Home examination

Forms of assessment	Time	Percentage	Deadline
HOME EXAMINATION	1.0 Weeks	1/1	

LING2203 Semantics II

Teaching: Spring: 7.50 Cr
Language of instruction: English, Norwegian
Credit reduction: HFLING205: 7.50 Cr, HFLING205A: 7.50 Cr
Grade: Letter grade
Compulsory assignments: 4 approved exercises with supervision
Recommended previous knowledge: LING1103 Semantics I.
Learning objectives: The objective is that the students actively can apply a formal semantic theory on a language, regardless of the typological classification of that language.
Academic content: This course offers an introduction to formal as well as computationally oriented semantics, including Minimal Recursion Semantics and systems based on conceptual semantics.
Teaching methods and activities: Lectures and group instructions.
More on assessment: Obligatory exercises must be approved before students are allowed to take the take-home exam. The size

of the exercises must be between 6-10 typed A4-pages each (line spacing 1.5).
The size of the take-home exam depends partly on the subject, but is usually between 8-15 typed A4-pages (line spacing 1.5).
Assessment: Home examination

Forms of assessment	Time	Percentage	Deadline
HOME EXAMINATION	1.0 Weeks	1/1	

LING2204 Pragmatics II

Teaching: Autumn: 7.50 Cr
Language of instruction: English, Norwegian
Credit reduction: HFLING206: 7.50 Cr, HFLING206A: 7.50 Cr
Grade: Letter grade
Compulsory assignments: 3 approved exercises with supervision
Recommended previous knowledge: LING1104 Pragmatics I.
Learning objectives: The objective is to enable the students to read original literature on pragmatic topics and to base their work with the term paper on what they have read and understood.
Academic content: This course offers an introduction to pragmatic theory with an emphasis on relevance theory. Central topics are the relationship between semantics and pragmatics, the relationship between truth-functional and non-truth-functional content, the relationship between explicit and implicit communication and the relation between descriptive and interpretative language use.
Teaching methods and activities: Lectures and group instructions.
More on assessment: Obligatory exercises must be approved before students are allowed to take the take-home exam. The size of the exercises must be between 8-12 typed A4-pages each (line spacing 1.5).
The size of the take-home exam depends partly on the subject, but is usually between 8-15 typed A4-pages (line spacing 1.5).
Assessment: Home examination

Forms of assessment	Time	Percentage	Deadline
HOME EXAMINATION	1.0 Weeks	1/1	

LING2206 Computational Linguistics I

Teaching: Spring: 7.50 Cr
Language of instruction: English, Norwegian
Credit reduction: HFLING215: 7.50 Cr
Grade: Letter grade
Compulsory assignments: 3 approved exercises with supervision
Recommended previous knowledge: EXFAC0003 Language and Literature, EXFAC0006 Introduction to Informatics, Language and Culture, or equivalent.
Learning objectives: The students will acquire knowledge of basic theories and methods in rule-based computational language analysis.
Academic content: This topic offers an introduction to rule-based strategies in language technology, including finite state machines, formal grammars, parsing algorithms, unification-based formalisms and their relation to technological systems like machine translation. A basic introduction to programming will be provided if necessary.
Teaching methods and activities: Lectures, group instructions and laboratory work. More on assessment: Obligatory exercises must be approved before students are allowed to take the take-home exam. The size of the exercises must be between 3-5 typed A4-pages each (line spacing 1.5). The size of the take-home exam depends partly on the subject, but is usually between 8-15 typed A4-pages (line spacing 1.5).
Assessment: Home examination

Forms of assessment	Time	Percentage	Deadline
HOME EXAMINATION	1.0 Weeks	1/1	

LING2207 Grammar Engineering I

Teaching: Spring: 7.50 Cr
Language of instruction: English, Norwegian
Grade: Letter grade
Compulsory assignments: 3 approved laboratory exercises with written remarks
Recommended previous knowledge: LING1101 Syntax I, LING1103 Semantics I, LING2201 Syntax II and LING2203 Semantics II.
Learning objectives: The objective is that the students can use a grammar engineering platform (like LKB or XLE) for the coding of elementary lexical, morphological and syntactic operations, and get an understanding of the computational linguistic assumptions underlying the coding and its processing.
Academic content: This course offers an introduction to computational coding of grammatical information. The course includes an elementary introduction to general parsing and generating algorithms, and training in the use of a computational platform, such as LKB or XLE, applied to simple grammar fragments.

Teaching methods and activities: Lectures, group instructions and laboratory work. More on assessment: Obligatory exercises must be approved before students are allowed take the exam. The size of the take-home exam depends partly on the subject, but is usually between 8-15 typed A4-pages (line spacing 1.5).
Assessment: Home examination

Forms of assessment	Time	Percentage	Deadline
HOME EXAMINATION	1.0 Weeks	1/1	

LING2216 Computational Linguistics II

Teaching: Autumn: 7.50 Cr
Language of instruction: English, Norwegian
Credit reduction: HFLING215: 7.50 Cr
Grade: Letter grade
Compulsory assignments: 3 approved exercises with supervision
Recommended previous knowledge: LING2206 Computational Linguistics I, TMA4240 Statistics, or equivalent.
Learning objectives: Students will learn about statistical approaches to automatic language processing.
Academic content: This course emphasises statistically based machine engineering techniques with examples primarily from speech tagging and automatic translation. Combinations of rule-based and probability-based techniques are also discussed.
Teaching methods and activities: Lectures, group instructions and laboratory work. More on assessment: Obligatory exercises must be approved before the student is admitted to take the exam. The size of the exercises must be between 3-5 typed A4-pages each (line spacing 1.5). The size of the take-home exam depends partly on the subject, but is usually between 8-15 typed A4-pages (line spacing 1.5).
Assessment: Home examination

Forms of assessment	Time	Percentage	Deadline
HOME EXAMINATION	1.0 Weeks	1/1	

LING2217 Grammar Engineering II

Teaching: Spring: 7.50 Cr
Language of instruction: English, Norwegian
Grade: Letter grade
Compulsory assignments: 3 approved laboratory exercises with written remarks
Recommended previous knowledge: LING1101 Syntax I, LING1103 Semantics I, LING2201 Syntax II, LING2203 Semantics II and LING2207 Grammar Engineering I.
Learning objectives: The objective is that the students can use a grammar engineering platform (like LKB or XLE) for the coding of lexical, morphological and syntactic operations beyond the most elementary ones, and especially that they can integrate semantic information into a grammar.
Academic content: This course is a direct continuation of Grammar Engineering I, increasing in a stepwise fashion the range of grammatical and semantic phenomena as implemented on the selected developmental platform, so that the student is eventually able to model most kinds of phenomena using the platform.
Teaching methods and activities: Lectures, group instructions and laboratory work. More on assessment: Obligatory exercises must be approved before students are allowed to take the exam. The size of the take-home exam depends partly on the subject, but is usually between 8-15 typed A4-pages (line spacing 1.5).
Assessment: Home examination

Forms of assessment	Time	Percentage	Deadline
HOME EXAMINATION	1.0 Weeks	1/1	

LING2221 Intonation

Teaching: Autumn: 15.0 Cr
Language of instruction: English, Norwegian
Credit reduction: HFLING209: 15.0 Cr, HFLING209A: 7.50 Cr
Grade: Letter grade
Compulsory assignments: 3 approved exercises with supervision
Recommended previous knowledge: LING2202 Phonology II, LING2204 Pragmatics II.
Learning objectives: The objective is to increase the student's awareness of the importance of intonation and other prosodic features in spoken communication and of how intonation interacts with a series of other linguistic features in conversation.
Academic content: This course offers an introduction to models of describing sentence intonation, and looks at elements of syntax, semantics and pragmatics that may influence the fundamental frequency patterns in Norwegian utterances. A central theme is the importance of intonation in the nexus between phonetics, phonology, syntax and pragmatics. The course places emphasis on the way intonation creates context for the listener. This is a prerequisite for the understanding of the total content of the utterance. The relationship between word prosody (especially stress and word accent) and utterance prosody (intonation) is central to the course.
Teaching methods and activities: Lectures and group instructions. More on assessment: Obligatory exercises must be approved before students are allowed to take the exam. The size of the exercises must be between 12-15 typed A4-pages each (line

spacing 1.5). The size of the take-home exam depends partly on the subject, but is usually between 10-30 typed A4-pages (line spacing 1.5).
Assessment: Home examination

Forms of assessment	Time	Percentage	Deadline
HOME EXAMINATION	2.0 Weeks	1/1	

LING2222 Language Typology

Teaching: Autumn: 15.0 Cr
Language of instruction: English, Norwegian
Credit reduction: HFLING214: 15.0 Cr, HFLING214A: 15.0 Cr
Grade: Letter grade
Compulsory assignments: 3 approved exercises with supervision
Recommended previous knowledge: LING1102 Phonology I, LING1103 Semantics I and LING2201 Syntax II
Learning objectives: The objective is that the students get an understanding of how the morpho-syntactic construction of languages can vary typologically, and at the same time learn how grammar formalisms can be built up to reflect these variations.
Academic content: This course offers an introduction to typological traits used in the classification and analysis of the world's languages. These traits may be of a morphological, syntatic, semantic, pragmatic or phonological character, and various language areas may be emphasized. The course also teaches students to work with formal frameworks (such as LFG, HPSG) in relation to languages that contain radically different properties from what the frameworks are originally based on.
Teaching methods and activities: Lectures and group instructions.
More on assessment: Obligatory exercises must be approved before students are allowed to take the exam. The size of the exercises must be between 6-10 typed A4-pages each (line spacing 1.5). The size of the take-home exam depends partly on the subject, but is usually between 10-30 typed A4-pages (line spacing 1.5).
Assessment: Home examination

Forms of assessment	Time	Percentage	Deadline
HOME EXAMINATION	2.0 Weeks	1/1	

LING3001 Syntax and Semantics

Teaching: Both autumn and spring: 15.0 Cr
Language of instruction: English, Norwegian
Credit reduction: HFLING301: 15.0 Cr
Grade: Letter grade
Compulsory assignments: 3 approved exercises with supervision
Recommended previous knowledge: Bachelor's degree with a Major in Linguistics, LING2201 Syntax II and LING2203 Semantics II.
Learning objectives: The objective is that the students get a sufficiently thorough introduction to a syntactic or semantic field such that they will be able to independently perform thorough studies within the field.
Academic content: This course offes a deeper introduction to fields treated in Syntax II, Language Typology or Sematics II. Topics discussed will vary from semester to semester.
Teaching methods and activities: Lectures and group instructions.
More on assessment: Obligatory exercises must be approved before students are allowed to hand in the term paper. The size of the exercises must be between 10-20 typed A4-pages each (line spacing 1.5). The size of the term paper depends partly on the subject, but is usually between 15-30 typed A4-pages (line spacing 1.5).

Assessment: Assignment

Forms of assessment	Time	Percentage	Deadline
ASSIGNMENT		1/1	

LING3003 Pragmatics III

Teaching: Spring: 15.0 Cr
Language of instruction: English, Norwegian
Credit reduction: HFLING303: 15.0 Cr
Grade: Letter grade
Compulsory assignments: 3 approved exercises with supervision, approved oral presentation
Recommended previous knowledge: Bachelor's degree with a Major in Linguistics, LING1104 Pragmatics I and LING2204 Pragmatics II.
Learning objectives: The objective is to prepare students so that they are able to carry out the research work that goes into writing of a Master's thesis on a pragmatic topic.
Academic content: This course consists of reading and assessing newer original literature in pragmatic theory.
Teaching methods and activities: Lectures and group instructions.
More on assessment: Obligatory exercices and oral presentation must be approved before students are allowed to hand in the

term paper. The size of the exercises must be between 12-15 typed A4-pages each (line spacing 1.5). The size of the term paper depends partly on the subject, but is usually between 15-30 typed A4-pages (line spacing 1.5).
Assessment: Assignment

Forms of assessment	Time	Percentage	Deadline
ASSIGNMENT		1/1	

LING3005 Grammar Engineering III

Teaching: Autumn: 15.0 Cr
Language of instruction: English, Norwegian
Grade: Letter grade
Compulsory assignments: 3 approved laboratory exercises with written remarks
Recommended previous knowledge: Bachelor's degree with a Major in Linguistics, LING2217 Grammar Engineering II.
Learning objectives: The objective is that the students are sufficiently trained in grammar engineering to independently perform the construction of a medium-sized grammar.
Academic content: This course offers an introduction to the development of a "core grammar", or a computational grammar where there is core-selection of the phenomena that together make up a grammar. (Phenomena treated in Grammar Engineering II will serve as a part of the integrated system. Students are encouraged to work with languages for which there has not already been developed a core grammar, but this is not a condition for language choice.)
Teaching methods and activities: Lectures, group instructions and laboratory work. More on assessment: Obligatory exercises must be approved before students are allowed to hand in the term paper. The size of the written remarks must be between 6-10 typed A4-pages each (line spacing 1.5). The size of the term paper depends partly on the subject, but is usually between 15-30 typed A4-pages (line spacing 1.5).
Assessment: Assignment

Forms of assessment	Time	Percentage	Deadline
ASSIGNMENT		1/1	

LING3006 Phonology III

Teaching: Autumn: 15.0 Cr
Language of instruction: English, Norwegian
Credit reduction: HFLING302: 15.0 Cr
Grade: Letter grade
Compulsory assignments: Approved oral presentation
Recommended previous knowledge: Bachelor's degree with a Major in Linguistics, LING1102 Phonology I and LING2202 Phonology II.
Learning objectives: The objective is to prepare students on a theoretical and practical basis so that they are able to carry out the research work that goes into writing a Master's thesis on a phonological topic.
Academic content: This course consists of reading and assessing literature pertaining to phonological theory and analysis.
Teaching methods and activities: Lectures and group instructions.
More on assessment: Obligatory oral presentation must be approved before students are allowed to hand in the term paper. The size of the term paper depends partly on the subject, but is usually between 15-30 typed A4-pages (line spacing 1.5).
Assessment: Assignment

Forms of assessment	Time	Percentage	Deadline
ASSIGNMENT		1/1	

LING3392 M.Phil. Thesis in Linguistics

Teaching: 1st sem. spring, 2nd sem. autumn: 45.0 Cr
Credit reduction: HFLING391: 45.0 Cr, HFLING390: 45.0 Cr, LING3390: 45.0 Cr, LING3391: 45.0 Cr
Grade: Letter grade
Compulsory assignments: None
Required previous knowledge: Requires admission to the M.phil. programme in linguistics.
Learning objectives: The goal is to make students capable of both conducting independent research under supervision, and enabling the students to document their ability to do research that meets the requirements of scientific publishing.
Academic content: Starting point: The Master's Thesis is an independent scientific work performed under supervision. Content: Normally, the thesis is thematically connected to one of the master subjects. A plan for the thesis is to be set up together with one of the instructors in the department, normally the person who will be acting as supervisor. The plan (stating theme, central problem and method) must be approved by the department, and a supervisor must be appointed before starting the work.
Teaching methods and activities: Independent work with supervision. The thesis is normally at least 50 typed A4-pages (ling spacing 1.5). Joint work can be approved as a Master's Thesis if each contribution is clearly marked and if each contribution is equivalent to a normal Master's Thesis with respect to amount of work and size. Assessment includes the thesis and a final oral exam. The oral exam will affect the grade on the thesis.
Assessment: Thesis

Forms of assessment	Time	Percentage	Deadline
THESIS		1/1	

MASTER OF APPLIED ETHICS

Course outline

Applied Ethics is a growing, interdisciplinary field of study dealing with ethical problems in different areas of society. In Applied Ethics the aims of, and problems in, special fields of human activity such as business, politics, technology and medicine are analysed from an ethical point of view. From the perspective of ethics, Applied Ethics is a specialisation in one area of ethics. From the perspective of social practice, applying ethics involves focusing on the ethical aspects and ethical implications of that particular practice.

The field of Applied Ethics is so broad and expanding that it is virtually impossible for any one institution to offer expertise and professional guidance for thorough research in every field of specialisation. The formation of a consortium of four universities broadens the potential research base for students, and provides an opportunity for specialisation on the basis of both competence and interest.

The Master in Applied Ethics (MAE) is an Erasmus Mundus master, and it is open to students with a bachelor's degree with a specialisation/major in ethics, or students who have completed a programme of professional study. For application, see http://www.maeappliedethics.eu/start. Deliberately integrating these diverse categories of students is part of the learning experience. The MAE curriculum has been designed to be flexible in order to fulfil the demands of both categories of student, with options that fit the specific needs, strengths and weaknesses of both student groups.

The programme covers two semesters of full-time study (60 ECTS credits). The first semester comprises different courses in applied ethics offered by the collaborating institutions. The second semester comprises either a combination of courses in applied ethics and a master's thesis, or a full semester devoted solely to a master's thesis.

Courses in different areas of Applied Ethics are offered by the different institutions, according to their respective academic strengths and expertise. Hence, a student with an interest in, for instance, bioethics will take the course Bioethics offered in Linköping, or the course in Animal and Nature Ethics offered in Utrecht. During the second semester students can then write their master's thesis in Linköping or Utrecht under the supervision of the professor of bioethics at either institution. However, in order to increase flexibility and possible options it is also possible for students to take a course at one university and then to move to another university for their thesis work.

The MAE offers students different options depending on their educational background and interests. Students with an academic background in ethics, with a specialisation/major in, for example, ethics, philosophy or religious studies, can either take courses in applied ethics (approx. 30 ECTS credits), and write a master's thesis of 30 ECTS, or take courses with a combined scope of 45 ECTS and write a master's thesis of 15 ECTS. In order to acquire sufficient competence in ethics and applied ethics, students with a professional background must take courses comprising 45 ECTS credits and write a master's thesis of 15 ECTS.

Student mobility

Since each collaborating institution offers at least 75 percent of a full programme of relevant courses, students are offered plenty of possibilities for mobility within the MAE. First, all students are gathered together for the introductory course at one of the four participating universities. Then, student mobility will be determined by students' choice of courses, with the restriction that at least one of the courses chosen must be carried out at a second institution. Students are recommended to write their master's thesis at the same institution in which they take at least one of the courses.

Aims and learning outcomes

The objective of the master's programme in Applied Ethics is to create and develop ethical reflection and ethical competence, both of which should combine relevant theoretical and practical knowledge, understanding, and evaluation. More specifically, the aim is to achieve competence in:

Identifying and analysing moral problems in different social and professional contexts

Contributing in a sound and responsible manner to public debates on moral issues, and being able to structure and evaluate these debates

Formulating theory-based policy recommendations and assessments regarding moral issues in specific practices (e.g., health care, law, business, ICT or journalism)

Organising constructive ethical deliberation in institutional and professional contexts.

In this way, the programme will enhance the quality of applied ethics as an academic field. Furthermore, it will be instrumental in focusing on the ethical aspects of medicine, technology, politics and business and, hence improve the quality of these practices on a European level. The MAE leads both to the acquisition of professional competence and also provides a valuable learning experience in its own right.

It provides students with professional competence in applied and professional ethics and It develop students' knowledge of and ability for critical reflection on pertinent moral problems in modern society.

The learning outcomes of a master's course in applied ethics are manifold. Students acquire knowledge of the history of ethics and applied ethics. They also learn about different fields of applied ethics. Furthermore, they learn how to identify a moral issue and they acquire the methodological competence to analyze and solve moral problems. Through thesis work, students learn how to delimit, plan, carry through and present an analysis in applied ethics.

Courses

Course code	Course title	Credits	Semester	Restricted admission
FI5201	Multicultural Conflicts and Ethics	15	Autumn	Yes
FI5202	Master's Thesis in Applied Ethics	30	Spring	Yes
FI5204	Reading Course in Applied Ethics	15	Spring	Yes
FI5205	Corporate responsibility and ethics	7,5	Autumn	Yes
FI5206	Technology for a good society	7,5	Autumn	Yes

Teaching and examinations

Courses are examined by means of a variety of written assignments that are complemented by oral and written tests. The essays are assessed by the teacher and an external examiner appointed from any one of the other partner institutions. In the case of the master's thesis, a final presentation and defence before an examination committee is required in order to obtain a master's degree. An examination committee, consisting of teachers from the partner institutions, will assess the quality of the thesis and will decide the grade that is awarded.

Students who have failed an examination are normally allowed to retake it. Students who have failed to receive a passing grade for their thesis will normally be given a chance to improve the thesis and re-present it later. However, this possibility is subject to different the national laws relating to universities and colleges in the different countries concerned, as well as to the specific study regulations in force at the collaborating institutions.

Admission requirements

Applicants must satisfy the following general admission requirements:

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

Minimum formal requirements for admission to the MAE programme are either a completed bachelor's degree or equivalent approved education, or a completed programme of professional study. In both cases at least three years of full-time study is required. Applicants must submit a paper in which they demonstrate their basic knowledge of, and their affinity with, ethical questions. Students who do not have English as their first language must document their proficiency in English by submitting results from a TOEFL test with a minimum score result of 213/550, or another internationally recognised test. The main selection criteria will be the quality of the student's previous work in ethics and his or her previous professional experience. Utrecht University will charge tuition fees.

Course descriptions

FI5201 Multicultural Conflicts and Ethics

Teaching: Autumn: 15.0 Cr
Language of instruction: English
Grade: Letter grade
Compulsory assignments: At least 75% attendance to the guidance
Required previous knowledge: Addmitted to the Erasmus Mundus programme "Master in Applied Ethics".
Learning objectives: The learning outcomes of a master?s course in applied ethics are manifold. Students acquire knowledge of the history of ethics and applied ethics. They also learn about different fields of applied ethics. Further, they learn how to identify a moral issue and achieve methodological competence for analysing and solving moral problems. Through thesis work, the students learn how to delimit, plan, carry through and present an analysis in applied ethics.
Academic content: Multicultural conflicts might be viewed in the light of global traits of modern societies. On the one hand, modern societies are getting more open and more democratic compared to earlier times; on the other hand, there are also many signs of closure that might be envisaged as different kinds of fundamentalism. Cultures gradually become more integrated, and at the same time conflicts between them are escalating. An important aim of this course is to discuss multicultural conflicts in a philosophical and ethical perspective, from the background of different ethical positions (liberalism, communitarianism, discourse ethics).
Course materials: The curriculum/reading list is available from the Department office.
Teaching methods and activities: Lectures, seminars and self-study. Attendance (75%) must be approved to take the exam. Practical information regarding the essay: Date for submission is given under the examination dates. Two hard copies before 2 p.m. to the Department Office. Length: 15-20 pages using 12-point Times New Roman, 1.5 line spacing. Front page: Course code, date, student id. The oral exam will have a duration of approximately 40 minutes.
Assessment: Assignment/Oral examination

Forms of assessment	Time	Percentage	Deadline
ASSIGNMENT	30.0 Days	6/10	
ORAL EXAMINATION		4/10	

FI5202 Master Thesis in Applied Ethics

Teaching: Spring: 30.0 Cr
Language of instruction: English
Grade: Letter grade
Compulsory assignments: None
Required previous knowledge: Addmitted to the Erasmus Mundus programme "Master in applied Ethics".
Learning objectives: The learning outcomes of a master?s course in applied ethics are manifold. Students acquire knowledge of the history of ethics and applied ethics. They also learn about different fields of applied ethics. Further, they learn how to identify a moral issue and achieve methodological competence for analysing and solving moral problems. Through thesis work, the students learn how to delimit, plan, carry through and present an analysis in applied ethics.
Academic content: In the second semester, students concentrate on a selected area of specialisation, conducting supervised thesis research leading to the completion of a master?s thesis. Parallel to this the students take part in advanced seminars in ethics. The thesis is to be completed over a period of twenty weeks. At the end of the semester the thesis will be presented and defended at a seminar. The host university is responsible for teaching and tutoring. The language of the thesis is English.
Course materials: The curriculum/reading list is available from the Department office.
Teaching methods and activities: Seminars/lectures and self-study.
The essay should have a total length of 20-30 pages using 12-point Times New Roman, 1.5 line spacing. Front cover must contain the following information: Course code, date of admission and your NTNU student number. The oral exam will have a duration of approximately 40 minutes.
Assessment: Thesis/Oral examination

Forms of assessment	Time	Percentage	Deadline
THESIS		8/10	
ORAL EXAMINATION		2/10	

FI5204 Reading Course in Applied Ethics

Teaching: Spring: 15.0 Cr
Language of instruction: English
Grade: Letter grade
Compulsory assignments: None
Required previous knowledge: Addmitted to the Erasmus Mundus programme "Master in applied Ethics".
Learning objectives: The learning outcomes of a master?s course in applied ethics are manifold. Students acquire knowledge of the history of ethics and applied ethics. They also learn about different fields of applied ethics. Further, they learn how to identify a moral issue and achieve methodological competence for analysing and solving moral problems. Through thesis work, the students learn how to delimit, plan, carry through and present an analysis in applied ethics.

Academic content: In the second semester, students concentrate on a selected area of specialisation, conducting supervised thesis research leading to the completion of a master?s thesis. Parallel to this the students take part in advanced seminars in ethics. The thesis is to be completed over a period of twenty weeks. At the end of the semester the thesis will be presented and defended at a seminar. The host university is responsible for teaching and tutoring. The language of the thesis is English.
Course materials: The curriculum/reading list is available from the Department office.
Teaching methods and activities: Seminars/lectures and self-study.
The essay should have a total length of 15-20 pages using 12-point Times New Roman, 1.5 line spacing. Front cover must contain the following information: Course code, date of admission and your NTNU student number. The oral exam will have a duration of approximately 40 minutes.
Assessment: Assignment/Oral examination

Forms of assessment	Time	Percentage	Deadline
ASSIGNMENT		6/10	
ORAL EXAMINATION		4/10	

FI5205 Corportate Responsibility and Ethics

Teaching: Autumn: 7.50 Cr
Language of instruction: English
Grade: Letter grade
Compulsory assignments: None
Required previous knowledge: Addmitted to the Erasmus Mundus programme "Master in Applied Ethics".
Academic content: The pressure on business to take social responsibility has increased the last few decades. Globalization and other structural changes in society and economic life are parts of the reason for this development. Does a strengthening of corporate power mean an increased social responsibility for business? Or is the business realm free from moral responsibility in the pursuit of pure economic gains? This course aims at discussing the concept of Corporate Social Responsibility (CSR) from a philosophical and ethical perspective, focussing on the relationship between ethical reasoning and economic rationality.
Course materials: The curriculum/reading list is available from the Department office.
Teaching methods and activities: Lectures and plenary discussions. A compendium containing the syllabus is available at the Department of Philosophy and at the first lecture.
Essay and oral exam. The essay should be 5-10 pages long in 12 point Times New Roman, 1,5 line spacing. 2-4 alternative essay topics will be presented to the students at the beginning of the course. There will also be an additional oral exam.
Assessment: Assignment/Oral examination

Forms of assessment	Time	Percentage	Deadline
ASSIGNMENT			
ORAL EXAMINATION			

FI5206 Technology for a Good Society

Teaching: Autumn: 7.50 Cr
Language of instruction: English
Grade: Letter grade
Compulsory assignments: None
Assessment: Assignment/Oral examination

Forms of assessment	Time	Percentage	Deadline
ASSIGNMENT			
ORAL EXAMINATION			

MASTER OF SCIENCE IN GLOBALIZATION

What is the Master's in Globalization?

During this two-year International Master's programme in Globalisation, you will explore the interrelations between the economic, technological, cultural, social and political dimensions of globalisation and choose between two specialisations: Global Technology Management and Global Politics and Culture. You will also gain practical experience through a semester-long internship in a global corporation, multilateral organization or international campaigning group. If you are an International student, your internship will take place in Norway. If you are student with a Norwegian or Nordic educational background, your internship will take place outside Norway. The aim of the programme is to provide you with a general understanding of the form and consequences of the processes of globalisation, combined with an in-depth knowledge of one of the two fields of specialisation. The course will investigate globalization as a multi-dimensional phenomenon with a focus on its implications for civil society, state power, changing patterns of national culture and global markets and technologies.

The Master's in Globalization is a unique inter-disciplinary cooperative programme involving NTNU's Faculties of Social Sciences, Humanities, Engineering and Technology, and Information Technology, Maths and Electronics. It is part of NTNU's university-wide Globalization Programme, which comprises 180 researchers in departments across the university.

Career Opportunities

This Master's programme is designed to provide its students with the specialist knowledge and transferable skills to pursue careers in global corporations, non-governmental organisations or with international campaigning groups. 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.

Courses: Joint courses across the two specializationst

Course code	Course title	ECTS credits	Semester	Restricted admission
GEOG3518	Knowledge Management in a Global Economy	7,5	Autumn	
HIST3295	Contemporary International Economic History	7,5	Autumn	
GEOG3800	Experts in team: The Global Village **)	7,5	Spring	
SANT3501	Identity (Global Culture Distance Learning Course)	7.5	Autumn	
GLOB3001	Internship Work Project *)	22,5	Autumn	
GLOB3900	Master's Thesis in Globalization (at NTNU) *)			
*) The courses will be instructed during the academic year 2008-2009, see semester breakdown below. **) Course descriptions for the Experts in team courses (called 'villages') will be made available from the Web in the autumn semester of 2007.				

Courses: Global Technology Management

Course code	Course title	ECTS credits	Semester	Restricted admission
TPK5100	Project Management 1	7,5	Autumn	
TIØ4195	Environmental Management and Corporate Social Responsibility *)	7,5	Autumn	
TDT4245	Cooperation Technology *)	7,5	Autumn	
TPK5110	Quality and Risk Management in Projects *)	7,5	Autumn	
TPK4160	Value Chain Control and Applied Decision Support*)	7,5	Autumn	
TIØ4280	Change and ICT in Complex Systems	7,5	Spring	
TPK4135	Logistics and Production Management	7,5	Spring	
TIØ4175	Industrial Management 4C - Logistics and Purchasing Management**)	7,5	Spring	
TPK4180	Global Manufacturing Strategy **)	7,5	Spring	
*) Choose one of these four courses, see semester breakdown below. **) Choose one of these two courses, see semester breakdown below.				

Courses: Global Politics and Culture

Course code	Course title	ECTS credits	Semester	Restricted admission
KULT3320	Globalization Theory	7,5	Autumn	
GEOG3050	Theories of Social Change	7,5	Autumn	
RVI2115	Religion and Politics in the Age of Globalization *)	15	Spring	
SØK1102	Introductory Development Economics *)	15	Spring	
MUSV1007	Music and Globalization *)	15	Spring	
POL3503	International Political Economy *)	15	Spring	
POL3004	Historical and Comparative Methods	7,5	Spring	
*) Choose one of these four courses, see semester breakdown below.				

Structure

Joint Activities and Courses across both Specializations
The Master's in Globalization is a two year programme, with 120 credits, 30 credits per semester over four semesters. The full names of the courses and a breakdown of each semester are given in the tables below. In semester 1, two courses (GEOG3518 and HIST3295) will be taken by students in both Global Technology Management and Global Politics and Culture specializations. The Experts in Team course in Semester 2, entitled "The Global Village" (details below) will also be a joint activity across both specializations. All students will spend Semester 3 in a global corporation or organization, during which time they will complete a written report. During this third semester, they will also take a distance learning course on Global Culture. The 30 credit Master's thesis should be completed in Semester 4.

Global Technology Management Specialization
In Semester 1, in addition to the joint activities and courses mentioned above, The Global Technology Management students will also take TPK 5100 and then select one additional course from a choice of four specialized options (see Table A). In semester 2, in addition to the Experts in Team course, they will take two courses (TIØ 4280 and TPK 4135) and chose a further one course from a choice of two specialized options.

Global Politics and Culture Specialization
In Semester 1, in addition to the joint courses and activities mentioned above, the Global Politics and Culture students will take also take KULT 3320 and GEOG 3050 (see Table B). In semester 2, in addition to the Experts in Team course, they will take POL 3004 and chose a further one course from a choice of four specialized options.

Master's Thesis
The 30 credit thesis should be between 50 and 70 pages in length (12 pt, 1,5 spacing). The contents of the thesis should fulfil an academic level appropriate to a Master's level course and should relate to the interdisciplinary framework of the taught course element of the Master's programme. An individual supervisor will be assigned in Semester 2, who will be responsible for supervising both the internship report and the Master's thesis. Students may chose to relate the contents of their Master's thesis to the internship report. A project proposal in the form of a written outline of the thesis (around 5 pages) should be submitted in Semester 2. The thesis should be written over a 20 week period in semester 4. The deadline for the submission of the thesis is normally June 15. Student 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.

Global Technology Management Semester Breakdown

Semester	7.5 credits	7.5 credits	7.5 credits	7.5 credits
4th sem. Spring	GLOB3900 Master's Thesis in Globalization (at NTNU) ***)			
3rd sem. Autumn	Internship			
	GLOB3001 Internship Work Project ***)			SANT3501 Global Culture Distance Learning Course - Identity
2nd sem. Spring	Experts in Team: GEOG3800 The Global Village *)	TIØ4280 Change and ICT in Complex Systems	TPK4135 Logistics and Production Management	TIØ4175 **) Industrial Management 4C – Logistics and Purchasing Management TPK 4180 **) Global Manufacturing Strategy
1st sem. Autumn	GEOG3518 *) Knowledge Management in a Global Economy	HIST3295 *) Contemporary International Economic History	TPK5100 Project Management 1	TIØ4195 **) Environmental Management and Corporate Social Responsibility TDT4245 **) Cooperation Technology TPK5110 **) Quality and Risk Management in Projects TPK4160 **) Value Chain Control and Applied Decision Support

*) Joint courses across the two specializations
**) Specialized options
***) The courses will not be taught in the academic year 2007-2008.

B. Global Politics and Culture Semester Breakdown

Semester	7.5 credits	7.5 credits	7.5 credits	7.5 credits
4th sem. Spring	GLOB3900 Master's Thesis in Globalization (at NTNU) ***)			
3rd sem. Autumn	Internship			
	GLOB3001 Internship Work Project ***)			SANT3501 Identity (Global Culture Distance Learning Course)
2nd sem. Spring	Experts in Team *) GEOG3800 The Global Village	POL3004 Historical and Comparative Methods	RVI2115 **) Religion and Politics in the Age of Globalization SØK1102 **) Introductory Development Economics MUSV1007 **) Music and Globalization POL3503 **) International Political Economy	
1. sem. Autumn	GEOG3518 *) Knowledge Management in a Global Economy	HIST3295 *) Contemporary International Economic History	KULT3320 Globalization Theory	GEOG3050 Theories of Social Change

*) Joint courses across the two specializations.
**) Specialized options.
***) The courses will not be taught in the academic year 2007-2008.

Experts in Team (EiT)
Experts in Team is an inter-disciplinary course which is compulsory for all NTNU Master's students. The teams are called "villages". The course focuses on problem-based learning and multidisciplinary cooperation in problem-solving within "real" industrial, commercial or social contexts. MSc in Globalization students will take part in the "Global Village" team, which aims at developing excellent "team players" within a cross-cultural environment. GEOG3800 The Global Village will create relevant knowledge on the functioning of international institutions within an increasingly globalized world. Students will study the globalized production system, using the case of a single transnational company. In addition, they will study the international humanitarian regime, focusing on the case of the International Red Cross.

Internships

The internship in the third semester provides a unique opportunity for students to develop and build their personal, academic and professional capacities by managing an individual work project within a global company or multilateral organization or international campaigning group. The work project should contribute an interdisciplinary perspective and should be relevant to the needs and requirements of the company/institution. It should lead to the production of a written report, which relates to the taught element of the programme and which fulfils the academic requirements of a Master's level programme. The internship will be undertaken under the supervision of an NTNU professor and an internship manager. In the first semester, students will receive information about the selection of internships and will send their CVs to the companies/organisations which interest them. In the second semester, students will receive project descriptions from the companies/organisations. During this semester, students will be matched with an NTNU supervisor and an internship supervisor, both of whom will follow their progress. A written report relating to the internship work project (between

30 and 40 pages; 12 pt, 1,5 spacing) should be submitted to NTNU by the end of the second semester (22, 5 credits).

Study Environment
The Master's programme is part of NTNU's highly interdisciplinary Globalization Programme, which comprises 180 researchers and research fellows from across the university. Students will benefit from this NTNU-wide Programme, which organises regular seminars, as well as workshops and international conferences. Students on this Master's programme will be working within an interdisciplinary environment in which social contacts and professional cooperation with researchers from the Globalization Programme and with fellow students will be an important component. The Master's programme includes a series of guest lectures, specifically geared at this programme, given by national and international specialists in globalization research.

Admission requirements

Who can apply to the MSc in Globalization?
The Master's in Globalization is open to:

- Students with a BA in a Humanities or Social Sciences or equivalent from a university or college.
- Students with a BSc in a Technological or Engineering discipline or equivalent from a university or college.
- Students at selected Institutes at NTNU who have finished the first 3 years of a 5 year Master's of Technology/Engineering. These students may opt into the Master's in Globalization programme by applying to the relevant Study Board(s) of their current programme. They will remain within their original department and graduate with a siv. ing. degree (in their original subject), with a specialization in Globalization.
- International students with equivalent backgrounds are encouraged to apply.

Additional Admissions Information
English language requirements for international students are TOEFL score: 500/170 or IELTS: 5.0.

Course descriptions

Joint courses across the two specializations

GEOG3518 Knowledge Management in a Global Economy
Teaching: Autumn: 7.50 Cr
Language of instruction: English
Grade: Letter grade
Compulsory assignments: Presentation
Required previous knowledge: Bachelor in geography. Other relevant qualifications can be accepted upon approval by the Department of Geography. In addition, the couse is open for students from IØT (3. year students).
Learning objectives: The course aims to provide a nuanced understanding of economic and cultural globalization. The central aims are to provide comprehensive insight in to the relations between processes of globalization and company strategies.
Academic content: Tuition is based on seminars in which the focus is on theory and empirical knowledge in the form of case studies. Different perspectives on globalization are presented, together with discussion on how this influences both businesses and national opportunities for agency. Focus is on the possibilities that enterprises have in a globalized and knowledge economy. Examples are used to illustrate how businesses can draw on their surroundings and networks locally, regionally, nationally, and internationally in their endeavours to innovate. The course presents how strategies and actions occur at the interface between economy and culture. Knowledge development across cultural boundaries is thus a central theme. This interdisciplinary course is founded on the collaboration between the Department of Geography and the Department of Industrial Economics and Technology Management.
Part of the course literature will consist of optional in-depth reading that students use in their written semester assignment (c.5000 words), to be presented at a seminar. Both the semester assignment and the presentation must be approved before the oral exam can be taken. A provisional grade is awarded for the assignment which is adjusted following the oral exam.
Teaching methods and activities: Teaching method: 25 hours (maximum) seminars
Compulsory activity: Presentation

Form of assessment: semester assignment. A provisional grade is awarded for the assignment which is adjusted following the oral exam.
Assessment: Assignment

Forms of assessment	Time	Percentage	Deadline
TERM PAPER		1/1	

HIST3295 International Economic Contemporary History

Teaching: Autumn: 7.50 Cr
Language of instruction: English
Grade: Letter grade
Compulsory assignments: Approved assignment as part of group instruction/term paper
Recommended previous knowledge: None
Required previous knowledge: BA in History or equivalent
Learning objectives: Historical insight in the twentieth century economic globalisation.
Academic content: Multinational companies have an increasing importance in the global economy. Why and how did they develop? What are their competitive advantages and why have they enjoyed so rapid growth after World War II?
The course also compares business systems of different countries. Why are American, German and e.g. South Korean multinationals different? The relations between business and politics will be reviewed as well as the criticism against big business / multinationals. The study of market power and cartels is also a part of this course.
Teaching methods and activities: Lectures and seminars.
Assessment: Home examination

Forms of assessment	Time	Percentage	Deadline

SANT3501 Autumn: 7.50 Cr

Language of instruction: Norwegian
Credit reduction: SVSANTX1/V02: 7.50 Cr
Grade: Letter grade
Compulsory assignments: None
Recommended previous knowledge: See formal requirements.
Required previous knowledge: Bachelor?s degree or the equivalent.
Learning objectives: To acquire analytical skills in the study of social identity.
Academic content: Identity is a central theme both in anthropology and in the self-understanding of groups and individuals. The course covers fields, as for instance ethnic identity, national identity, religious identity and gender identity. Central concepts and analytical methods for the study of the formation of identity will be examined and explored with reference to concrete empirical processes.
Teaching methods and activities: Lectures/seminars (approx. 18 hours).
4-hour written exam.
Assessment: Written examination

Forms of assessment	Time	Percentage	Deadline
WRITTEN	4.0 Hours	1/1	
HOME EXAMINATION	4.0 Days	1/1	

Global Technology Management (GTM)

TPK5100 Project Planning and Control

Teaching: Autumn: 7.50 Cr
Language of instruction: English
Grade: Letter grade
Compulsory assignments: Exercises, Project presentations
Recommended previous knowledge: None.
Learning objectives: The course aims at a thorough introduction to the project work, tools and techniques for evaluating, planning, and monitering projects.
Academic content: Management and project management, Projects, programmes and portfolios, Project types and categorization, Qualifications of project members, Project organization, general introduction, Project phases and life-cycle, Project structure, scope, and WBS, Project time schedules, costs and resources. Planning quality, cost and time, milestones and activities, Monitoring and controlling projects, Reporting progress, International standards and associations, Gender mainstreaming, Cultural mainstream.
Course materials: Will be given at course startup.
Teaching methods and activities: Lectures, e-learning, assignments, games and project work.
Grading is based on project work (40 %) and final exam (60 %). The lectures and exercises are in English. If there is a re-sit examination, the examination form may be changed from written to oral.

Assessment: Written examination/Work

Forms of assessment	Time	Percentage	Deadline
WRITTEN	4.0 Hours	60/100	

TIØ4195 Environmental Management and Corporate Social Responsibility

Teaching: Autumn: 7.5 Cr
Language of instruction: English
Credit reduction: SIS1047: 7.5 Cr, TIØ4195(v.1): 7.5 Cr
Grade: Letter grade
Compulsory assignments: Exercises
Recommended previous knowledge: The course is compulsory for SHE branch students and can be choosen by students at the Indecol programme. Other students may attend by agreement with the Institute of Industrial Economics and Technology Management.
Learning objectives: The subject shall give knowledge, understanding and skills to support the endeavours for sustainability, better environmental management and industrial practise under the vision of sustainable development and corporate social responsibility. The subject shall give understanding of ethical dilemmas and show connections between environmental and social responcibility in global value chains.
Academic content: The course departs from the principles of UNs Global Compact, the Global Reporting Initiatives GRI and Corporate Social Responsibility CSR, national and international environmental status and policy. It gives further insight into how environmental requirement from customers, authorities and other stakeholder in industrial networks and society impact the organization?s situation regarding competitiveness in a life cycle perspective. It further includes environmental management, CSR, legislation, international standards like EMAS and ISO-14000-standards Special attention is given to tools for environmental management like environmental analyses, LCA, environmental accounting, performance indicators, business environmental and sustainability reporting and auditing methodology.
Course materials: Is given at semester start.
Teaching methods and activities: Lectures and group based student works like lecturer, presentations and project work / field work connected to a company. Postponed/repeated exams may be oral.
Assessment: Portfolio assessment

Forms of assessment	Time	Percentage	Deadline
WRITTEN	4.0 Hours	60/100	
EXCERCISES		40/100	

TDT4245 Cooperation Technology

Teaching: Autumn: 7.50 Cr
Credit reduction: SIF8058: 7.50 Cr, IT1603: 0.0 Cr, AVS2220: 1.50 Cr, KULT2201: 3.0 Cr, AVS2220: 3.0 Cr, KULT2201: 1.50 Cr
Grade: Letter grade
Compulsory assignments: Exercises
Recommended previous knowledge: TDT4140 Software Engineering, or contact the teacher.
Learning objectives: The course aims at giving students a basic knowledge of computer supported cooperative work (CSCW). This knowledge should allow students to compare and choose different solutions for supporting cooperative work as well as design new technologies.
Academic content: Computer supported cooperative Work (CSCW), coordination, shared workspaces, cooperation support for nomadic users, design and evaluation of cooperative technologies.
Course materials: Compendium available at course start
Teaching methods and activities: Lectures and exercises. The course will be taught in English if there are students that do not speak Norwegian. For the continuation exam, the written exam can be substituted with an oral exam.
Assessment: Written examination

Forms of assessment	Time	Percentage	Deadline
WRITTEN	4.0 Hours	100/100	

TPK5110 Quality and Risk Management in Projects

Teaching: Autumn: 7.50 Cr
Language of instruction: English
Grade: Letter grade
Compulsory assignments: None
Recommended previous knowledge: Basic knowledge in statistics, probability theory, and project management.
Learning objectives: To give basic insight into the theoretical foundation and practical applications of quality and risk management in projects.
Academic content: The project's surroundings, the stakeholder model, stakeholder analysis and management, the business processes of projects, process modeling of projects, performance assessment of projects, using quality improvement tools in

projects. Risk managements focuses on risk identification, risk modeling and quantification, updating of risk model in light of the project evolution, and experience and feedback control loops.
Course materials: Selected papers and chapters in books and a course compendium in project risk identification and modeling.
Teaching methods and activities: Lectures and group work. The lectures and exercises are in English when students who do not speak Norwegian take the course. If there is a re-sit examination, the examination form may be changed from written to oral.
Assessment: Written examination

Forms of assessment	Time	Percentage	Deadline
WRITTEN	4.0 Hours	100/100	

TPK4160 Value Chain Control and Applied Decision Support

Teaching: Autumn: 7.50 Cr
Grade: Letter grade
Compulsory assignments: Exercises and a paper
Recommended previous knowledge: TPK4100 Operation Management.
TPK4135 Production logistics.
Learning objectives: The course will give the students a fundamental understanding and knowledge about the supply chain system with the emphasize on processes, ICT, design, and control. The students will be given knowledge on supply chain principals and how value chains can be established, managed and improved.
Academic content: Logistical operations in the supply chain systems: This contains theoretical aspects of supply chain management as well as major characteristics of the supply chain as product, customer/market, deliveries and distribution, production, replenishment, ICT, planning and forecasting. Methods for mapping, analyzing, smiulation and operation research will be applied for supply chain design and allocation of resources, localisation of manufacturing, inventory and distribution and environment- and cost considerations.
Course materials: Will be given at the beginning of the semester. The literature and prescribed text is English.
Teaching methods and activities: The lectures will be given in English if needed for foreign students. Lectures and exercises are a combination of literature and examples from textbooks, articles and practical cases in companies. The exercises counts for 40 % of the final grade. If there is a re-sit examination, the examination form may be changed from written to oral.
Assessment: Written examination/Work

Forms of assessment	Time	Percentage	Deadline
WRITTEN	4.0 Hours	60/100	
EXCERCISES		40/100	

TIØ4280 Change and ICT in Complex Systems

Teaching: Spring: 7.50 Cr
Language of instruction: English
Credit reduction: SIS1080(v.2): 7.50 Cr
Grade: Letter grade
Compulsory assignments: None
Recommended previous knowledge: Basic organization theory: TIØ4275/TIØ4180 or other comparable knowledge.
Required previous knowledge: None
Learning objectives: Succesfully ending this module the student will reach a level of knowledge that enables him or her to evaluate suggested approaches for change- and development in groups and organizations, especially when IT is involved. In addition the student will gain insigth in practical consultancy and the challenges met in change in complex systems.
Academic content: - The role of the organizational consultant.
- Organizatonal effect of technology based change.
- How do organizations meet new challenges?
- Complex processes and new paradigm.
- Teknology driven change vs planned change.
- Models for management development.
- The importance of well functioning teams i change.
- How to build an optimalteam.
- The importance of taking organizational culture and social constructs into account.
- How to adjust and use traditional approaches and interventions when IT is the central element.
Course materials: Cummings Worley: Organizational Development and Change. Collected papers. Sjøvold: Teamet - Universitetsforlaget.
Teaching methods and activities: Lectures, simulations og exercises. Investigation of your own "consulting-style" and your skills in team-work. Frequent use of guest-lectures from norwegian and international companies.
Assessment: Work

Forms of assessment	Time	Percentage	Deadline
EXCERCISES		100/100	

TPK4135 Logistics and Production Management

Teaching: Spring: 7.50 Cr
Credit reduction: SIO3047: 7.50 Cr
Grade: Letter grade
Compulsory assignments: Exercises, Short article
Recommended previous knowledge: Knowledge corresponding to TPK4100 Operation Management
Learning objectives: The subject is to give the students basic understanding for the logistics- and control processes in a manufacturing company, together with knowledge about principles, tools and systems to analyse, develop and perform these processes.
Academic content: Operation and control models for production and logistics. Control principles. MRP/MRP II/ERP: Material Requirements Planning, Manufacturing Resource Planning, Enterprise Resource Planning. Japanese Production philosophy, Lean Manufacturing, Toyota Production System, Kanban, Optimized Production Technology. Inventory control. Operational planning and control. Group technology, layout and material flow analysis. Packaging. ICT-systems in Operations Management.
Course materials: Will be given at the beginning of the semester.
Teaching methods and activities: Lectures and team based exercises concerning a real case. The lectures and exercises are in English when students who do not speak Norwegian take the course. At postponed exam (re-sit examination), a written exam may be changed to an oral exam.
Assessment: Written examination

Forms of assessment	Time	Percentage	Deadline
WRITTEN	4.0 Hours	100/100	

TIØ4175 Industrial Management 4C - Logistics and Purchasing Management

Teaching: Spring: 7.50 Cr
Credit reduction: SIS1036(v.2): 7.50 Cr
Grade: Letter grade
Compulsory assignments: Exercises
Recommended previous knowledge: Requires TIØ4265 Industrial Management 3 - Strategic Management or similar background.
Learning objectives: The course aims to provide insight into logistics and purchasing and, in particular, how companies are tied together in value chains and networks dominated by economic transactions. It is expected that students who take the course understand and master central concepts within the field as well as the challenges that the management in a company face when organising logistics and purchasing activities in order to contribute to value creation as well as interact with the environment of the company.
Academic content: Historical development of the discipline; central concepts in logistics; control principles; strategic issues and co-ordination of manufacturing, purchasing and materials management; economic considerations related to logistical and purchasing decisions; logistics and purchasing as strategic tools; sourcing strategies and strategies for selection of suppliers; development of supplier relationships and networks; as well as use of information and communication technology within the fields of logistics and purchasing.
Course materials: To be announced by the start of the semester.
Teaching methods and activities: Lectures and assignments. The course will be taught in English if foreign students are registered. All course material is in English. If there is a re-sit examination, the examination form may change from written to oral.
Assessment: Written examination

Forms of assessment	Time	Percentage	Deadline

TPK4180 Global Manufacturing Strategy

Teaching: Spring: 7.50 Cr
Grade: Letter grade
Compulsory assignments: Exercises
Recommended previous knowledge: TPK4100 Operations Management or similar knowledge.
Learning objectives: This course will provide an overview of the challenges facing manufacturing enterprises as they compete on the global playing field. The course will provide knowledge and skills to establish, structure, and manage global manufacturing enterprises in such a way that the overall competitiveness is improved.
Academic content: In this course, manufacturing and logistics is viewed from a strategic perspective. The course provides knowledge about manufacturing strategy, and how such strategies can be developed for global enterprises. The following topics will be covered: Globalisation and the implications for manufacturing. Strategic concepts, decisions areas, and development processes. Localisation of factories and processes. Engineering and establishment of manufacturing enterprises. Sourcing and automation strategies. Performance measurement, productivity improvement, and control in global value chains. Strategic network development, technology transfer, and use of best practices. The course includes several industrial cases, which will enhance the students? analytical and communicative skills within these topics.
Course materials: Will be given at the beginning of the semester.

Teaching methods and activities: Lectures, exercises and project work. Evaluation will be based on project work (40 %) and written exams (60 %). Admission to taking the exam requires 2/3 of the exercises to have been approved. At re-sit exam (make-up examination), a written exam may be changed to an oral exam.
Assessment: Written examination/Work

Forms of assessment	Time	Percentage	Deadline
WRITTEN	4.0 Hours	60/100	
EXCERCISES		40/100	

Global Politics and Culture (GPC)

KULT3320 Globalization

Teaching: Autumn: 7.50 Cr
Language of instruction: English, Norwegian
Credit reduction: Reduksjon med 7,5 studiepoeng i forhold til KULT3315.
Grade: Letter grade
Compulsory assignments: Oral exercise and written essay
Recommended previous knowledge: Completed Bachelor's degree and master's students at NTNU.
Learning objectives: The course objective is to provide students with insight into the concept of globalization and the discussions associated with it by studying the most significant literature on globalization theory.
Academic content: The term globalization is used to describe numerous phenomena and processes. The course focuses on social and cultural processes of change viewed in relation to economic globalization. Students will gain insight into theories of globalization as well as the driving forces behind various aspects of globalization. Important theoretical debates will be examined, such as questions like whether or not we are approaching a more homogenous world; the significance of the local in meeting with the global; and the question of change and continuity when global meets local. Via examples students will discuss if and how the concept of globalization can provide new and fruitful perspectives for understanding contemporary social developments.
Teaching methods and activities: Students will produce one oral and one written assignment (3 pages) to be assessed before a four-hours written exam.
Assessment: Written examination

Forms of assessment	Time	Percentage	Deadline
WRITTEN	4.0 Hours	1/1	

GEOG3050 Theories of Social Change

Teaching: 1st sem. autumn, 2nd sem. spring: 15.0 Cr
Language of instruction: English
Credit reduction: SVGEO350: 15.0 Cr, GEOG3504: 7.5 Cr
Grade: Letter grade
Compulsory assignments: Assignment, seminar presentation and term paper
Required previous knowledge: Bachelor in social science. Other relevant qualifications can be accepted upon approval by the Department of Geography
Learning objectives: Students shall broaden their knowledge of theories of social change through an introduction to different analytical perspectives in development theory and practise.
Academic content: GEOG 3050, Theories of Social Change and Development, is compulsory for students at the MPhil in Development Studies. The course serves as an introduction to the main theme of the MPhil programme. Students shall broaden their knowledge of theories of social change and development. Different theories will be introduced and examined with respect to key concepts, perspectives and key development challenges of our times such as poverty alleviation and growth, globalisation and marginalisation, gender and development, civil society mobilisation and other post-development discourses. The course draws on a wide range of practical and empirical knowledge, as the lecturers represent several disciplines within the social sciences and many have cross-cultural experience.
During the autumn term the course consists of lectures and one compulsory assignment, while the spring term consists of seminars/group work and term paper writing. The term paper should serve as an epistemology paper for the thesis and should be presented at a final seminar (compulsory).
Course materials: Will be given when the semester starts.
Teaching methods and activities: Lectures, seminars and term paper. Exam: written exam 6 hours (50%) and term paper (50%)
Assessment: Assignment/Written examination

Forms of assessment	Time	Percentage	Deadline
WRITTEN		1/2	
ASSIGNMENT		1/2	

RVI2115 Religion and Politics in the Age of Globalization

Teaching: Spring: 15.0 Cr
Language of instruction: Norwegian
Credit reduction: RVI 2110, reduksjon 7,5 sp. RVI 2010, reduksjon 5 sp.
Grade: Letter grade
Compulsory assignments: 1 approved exercise/assignment
Recommended previous knowledge: Skills equivalent to one year of university studies.
Required previous knowledge: None.
Learning objectives: The course will provide an understanding of the connection between religion and politics, focusing on contemporary issues. An important objective will be to illuminate the dialectic aspect of this interaction, i.e. the influence of religion on political processes, and political developments and their influence on religion.
The course aim is also to provide the student with a deeper understanding of the theoretical mattters concerning the study of religon, equipping the students for fruther studies in the field (master's degree).
For more information about the assessment, we refer students to the section's description of the grading scale. The description of the grading scale is found on the department's web pages and in hard copy.
Academic content: The course treats the subject-matter "Religion and Politics in the Age of Globalisation" by focusing on relations in the global society between ethnicity, nation and national identity, trans-national religious and political actors, and international organisations. Examples of relevant problem-areas are debates about multiculturalism and integration on national levels, and the corresponding debates about democracy, human rights, natural resources, and security on the level of the global society.
The course will also provide further study of the methodological and theoretical issues related to the study of religion, as well as deeper study of selected topics in the history of the disciplin. The course will thereby provide a further understanding of various approaches, how theories are formed, and related issues.
Course materials: The required reading list will be available at the beginning of the semester.
Teaching methods and activities: Instruction consists of lectures and seminars. In order to take the exam a written assignment must be submitted (2000-2500 words) and approved by a deadline announced at the beginning of the semester. The exam consists of a written assignment (3000 - 4000 words).
Assessment: Assignment

Forms of assessment	Time	Percentage	Deadline
ASSIGNMENT	4.0 Weeks	1/1	

SØK1102 Introductory Development Economics

Teaching: Spring: 15.0 Cr
Language of instruction: Norwegian
Credit reduction: SVSØ002: 15.0 Cr
Grade: Letter grade
Compulsory assignments: One approved term paper
Recommended previous knowledge: None.
Required previous knowledge: None.
Learning objectives: Students should have knowledge of the most important causes of non-development as well as conditions for economic development. Students should apply relevant theory to discuss the relationship between economic conditions, development and non-development.
Academic content: This course introduces the students to the main causes of economic non-development and conditions of economic development. Internal as well as external obstacles to development will be discussed, with an emphasis on the domestic conditions in developing countries. Important topics will be different theories of dual economies, the relationship between economic growth and foreign trade, the relationship between population growth and economic growth, the role of the state, and the possibilities and limitations of foreign aid. The course will be appropriate for students interested in problems of development, for instance within economy, social anthropology, political science, geography, history and the Master program of Social Change. The emphasis will be on graphical illustrations and there are no formal requirements in terms of mathematical knowledge.
Teaching methods and activities: 4 hours of lectures.
Compulsory activity: Approved term paper.
Assessment: Written examination

Forms of assessment	Time	Percentage	Deadline
WRITTEN	5.0 Hours	1/1	

MUSV1007 Music and Globalisation

Teaching: Spring: 15.0 Cr
Grade: Letter grade
Compulsory assignments: None
Learning objectives: The course provides an introduction to a selection of global music cultures, aiming at an understanding of these based on globalisation theories and musicological analysis.

Academic content: The course focuses on an understanding of global processes of change, in relation to folk- and art music, jazz and pop music.
Teaching methods and activities: Lectures. The examination essay should have a maximum length of 20 pages (typed 1,5/12)
Assessment: Home examination

Forms of assessment	Time	Percentage	Deadline
HOME EXAMINATION	1.0 Weeks	1/1	

POL3503 International Political Economy

Teaching: Both autumn and spring: 15.0 Cr
Language of instruction: English
Credit reduction: SVPOL343: 15.0 Cr, POL8503: 10.0 Cr
Grade: Letter grade
Compulsory assignments: Presentation
Recommended previous knowledge: See formal requirements.
Required previous knowledge: POL1000 or POL1001 or at least 60 credits in Economics.
Learning objectives: To introduce the students to the field of international political economy.
Academic content: The course offers an introduction to the field of international political economy, i.e. the interaction between markets and states at the international level. The students will be introduced to various theoretical models as well as previous empirical studies. For Master students in sociology formal requirements are waived for courses approved as non-mandatory special courses in sociology.
Course materials: To be decided at the start of the course.
Teaching methods and activities: Lectures/group discussions, 4 hours per week throughout the semester. Supervision of term paper.
Form of assessment: Term paper and oral examination. The oral exam covers the term paper as well as readings. The oral exam will be used to adjust the term paper?s grade by a maximum of one grade. The language of instruction is English. The course is offered when teaching resources are available.
Assessment: Assignment

Forms of assessment	Time	Percentage	Deadline
ASSIGNMENT		1/1	

POL3004 Historical and Comparative Methods

Teaching: Spring: 7.50 Cr
Language of instruction: English
Credit reduction: POL3002: 7.50 Cr
Grade: Letter grade
Compulsory assignments: Approved exercises
Recommended previous knowledge: See formal requirements.
Required previous knowledge: POL1001 and POL1002 or major in Sociology or History.
Learning objectives: To introduce the students to non-statistical methods and techniques applied in the study of political, social and economic relations.
Academic content: The course intends to present an overview of non-quantitative social scientific methods as a supplement to statistical and sociological qualitative analyses.
Course materials: To be decided at the start of the course.
Teaching methods and activities: Lectures/group discussions, 4 hours per week throughout the semester.
Assessment: Written examination

Forms of assessment	Time	Percentage	Deadline
WRITTEN	3.0 Hours	1/1	

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 9.01.2007.

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 within the interdisciplinary social studies of children and childhood. The aim 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 the new social studies of childhood. A child perspective represents a main integrative approach. Children's rights to protection, provision and participation, as stated in the UN Convention on the Rights of the Child (CRC), represent an important point of departure for discussing children as participants in play, child labour, community building and social, political, and economic reproduction of society at large. CRC can be seen as part of globalisation processes, producing particular images of what it means to be a child. An important task is to create comprehensive insights in and understanding of how the globalised conditions under which children grow up affect 'local' and 'national' childhoods in the western world, as well as in countries in the South. The ways in which children themselves explore and experience their everyday lives and childhoods will be explored.

Employment opportunities

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. In addition, the master's programme qualifies for work related to research, consultancy, teaching and supervision in the field of children, welfare and development.

ADMISSION REQUIREMENTS

The master's programme accepts students financed by the Quota Programme, Norwegian/Nordic students, and other students with individual funding. The total number of admitted students is 15. Admittance to the programme requires a bachelor's degree in a social science or humanities discipline, 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. Background in Social Anthropology, Geography, Sociology or History is recommended.
The language of instruction is English, and the applicants must document their English proficiency by achieving one of the following:
- A pass of the foundation course ("grunnkurs") in English at a Norwegian Upper Secondary School
- TOEFL-test with a minimum of 550 points (213 on computer-based test)
- IELTS-test with 6.0 points or better

COURSE OUTLINE

The master's programme in Childhood Studies involves two years of full-time studies. The programme is structured around core courses (45 credits) and elective courses (15 credits), which both provide a general introduction to theory and methodology and give the students the opportunity to qualify within particular topics. In addition, the programme consists of a master's thesis (60 credits). The normal workload for a full-time student for one academic year is 60 credits.

Core courses

Code	Title	Cr	Term	Restricted admission
BARN3101	Social Studies of Children and Childhood: Research Perspectives	7.5	Autumn	No
BARN3102	Children's Rights	7.5	Autumn	No
BARN3200	Methodology in Child and Childhood Research	15	Spring	No
BARN3400	Preparatory Course, Master's Thesis	7.5	Spring	Yes
BARN3500	Historical Perspectives on Childhood	7.5	Autumn	No
BARN3900	Master's Thesis	60	Autumn/ spring	Yes

Elective courses MPhil in Childhood Studies

Code	Title	Cr	Term	Restricted admission
BARN3300	Children and Development in the South	7.5	Spring	No
GEOG3506	Geography, Health and Development	7.5	Autumn	No
GEOG3515	Environment, Development and Changing Rural Livelihoods	7.5	Autumn	No
GEOG3516	Humanitarianism: Theory and Practice	7.5	Autumn	No
GEOG3561	Gender and Social Change	7.5	Autumn	No
PSY3082*	Relational and Cultural Aspects of Development	15	Autumn	Yes
PSY3085*	Specialization in Relational and Cultural Aspects of Development	7.5	Spring	Yes
SANT3504**	The Colonial and the Post-Colonial: Anthropology, History and Literature	7.5	Autumn	No

*This course may practice restricted admission. More information about this will be given at the start of the semester.
**This course will be offered in English if necessary

Outline of the MPhil programme in Childhood Studies

Semester	Course	Course	Course	Course
4th sem/spring 3rd sem/autumn	BARN3900 Master's Thesis (60 credits)			
2nd sem/spring	BARN3200 Methodology in Child and Childhood Research (15 credits)		Elective (7.5 credits)	BARN3400 Preparatory Course, Master's Thesis (7.5 credits)
1st sem/autumn	BARN3101 Social Studies of Children and Childhood: Research Perspectives (7.5 credits)	BARN3102 Children's Rights (7.5 credits)	BARN3500 Historical Perspectives on Childhood (7.5 credits)	Elective (7.5 credits)

At the beginning of the first semester a common ground between students and teachers will be established. Through social and academic arrangements everyone will get the opportunity to get to know each other. 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.
Students admitted to the study programme the autumn semester 2006 follow the study plan for the academic year 2006-2007. They do, however, have the right to exchange BARN3100 with BARN3101 and BARN3102, and BARN3300 with BARN3500, if they wish.

COURSE DESCRIPTIONS

Norwegian Centre for Child Research

BARN3101 Social Studies of Children and Childhood: Research Perspectives
Teaching: Autumn: 7.50 Cr
Language of instruction: English
Credit reduction: BARN3100: 7.50 Cr, BARN3001: 7.50 Cr
Grade: Letter grade
Compulsory assignments: None
Recommended previous knowledge: See required previous knowledge.
Required previous knowledge: Admittance to the course requires a bachelor's degree in a social science or humanities discipline, or equivalent.
Learning objectives:
* To generate knowledge about childhood as a social and cultural phenomenon, children's life-worlds, welfare and the politics of childhood in changing societies.
* To introduce key debates concerning the research of children's everyday life and culture, and contemporary perspectives on childhood.
* To discuss how cultural representations of childhood are dynamic and change with both time and space.
Academic content: The course addresses changing paradigms in child research, including childhood as development and childhood as socially constructed. Issues both of a structural nature, which has an implication for children's everyday lives and childhood, as well as children's agency in defining and giving meaning to their lives and activities, will be discussed. Discourse theoretical perspectives, challenging the split between agency and structure, will be included. The central issues are childhood and related themes such as generation, gender, life-course, ethnographies of childhood, identity and ethnicity as

these take form through varying processes like globalisation, institutionalisation, consumption and commercialisation.
Course materials: Information will be given at the beginning of the semester.
Teaching methods and activities: Total lecture hours: 20 hours.
Assessment: Written examination

Forms of assessment	Time	Percentage	Deadline
WRITTEN EXAMINATION	4.0 Hours	1/1	

BARN3102 Children's Rights

Teaching: Autumn: 7.50 Cr
Language of instruction: English
Credit reduction: BARN3100: 7.50 Cr
Grade: Letter grade
Compulsory assignments: Approved working paper and oral presentation
Recommended previous knowledge: See required previous knowledge.
Required previous knowledge: Admittance to the course requires a bachelor's degree in a social science or humanities discipline, or equivalent.
Learning objectives: The main objectives of the course are to provide students with knowledge on:
* Discourses on children's rights.
* Global discourses on the UN Convention on the Rights of the Child, and children's rights to provision, protection and participation.
* Regional conventions on children's rights (e.g. the African charter on the rights of the child).
* The dynamic relationship between globalisation processes and children's lives in different parts of the world.
Academic content: The course presents an overview of different declarations on children's rights in a historical perspective. It discusses the UN Convention on the Rights of the Child and its implications for children's lives in different parts of the world. Children's lives and welfare in the light of changing policies and processes of globalisation will be explored. Among the additional topics to be addressed include gender and girls' rights, emerging issues on the rights of minority-group children (e.g. the rights of street children, the rights of refugee children etc.), children as social participants in the economic, social and cultural reproduction of society, the role of NGOs in the implementation of the UN Convention on the Rights of the Child, assessments of national reports on children's rights, migration and ethnicity, childhood, time and space, childhood as symbolic space, etc. Throughout nuanced discussion, the course also addresses the competing discourses on children as autonomous beings or as dependent social becomings.
Course materials: Information will be given at the beginning of the semester.
Teaching methods and activities: Total lecture hours: 20 hours, total seminar hours: up to 12 hours. The course consists of: (1) A common introduction with lectures. (2) A seminar with presentation and discussion of the students' working papers. The students can choose between writing their working paper individually, or together with 1-2 of their fellow students. Each student will be required to comment on another student's working paper.
Assessment: Written examination

Forms of assessment	Time	Percentage	Deadline
WRITTEN EXAMINATION	4.0 Hours	1/1	

BARN3200 Methodology in Child and Childhood Research

Teaching: Spring: 15.0 Cr
Language of instruction: English
Credit reduction: BARN3002: 7.50 Cr
Grade: Letter grade
Compulsory assignments: Practical exercise, approved working paper and oral presentation
Recommended previous knowledge: See required previous knowledge.
Required previous knowledge: Admittance to the course requires a bachelor's degree in a social science or humanities discipline, or equivalent.
Learning objectives:
* To develop knowledge about methodological issues related to empirical research on childhood as a social phenomenon.
* To get insight into methodological discussions related to children's perspectives and children as informants.
* To develop knowledge about different qualitative as well as quantitative methods.
* To develop reflexivity about the relation between theoretical perspectives, methodology and research questions/topics.
Academic content: The course will provide an overview and theoretically discuss the various steps in the research process, such as collecting data, analysis, interpretation and the making of a research text. The possibilities and limitations related to the use of different methods will be addressed. Children's perspectives within research involve the exploration of children's everyday lives from children's perspectives and experiences. A grassroot's perspective like this entails a methodological orientation towards children as informants in the research process and calls for the use of a variety of methods. These include various forms of interviews, observations, visual methods and fieldwork. Methodological problems such as accessing children as informants and research ethics will be addressed. In addition, historical methods and discourse analysis of texts, documents and social practices will be included. Though the main emphasis is on qualitative research, various quantitative methods and the combination of qualitative and quantitative approaches will be addressed. The lectures will draw on ongoing empirical research based at the centre as well as from the international milieu of children and childhood researchers.
Course materials: Information will be given at the beginning of the semester.
Teaching methods and activities: Total lecture hours: 30 hours, total seminar hours: up to 16 hours. The course consists of: (1) A common introduction with lectures. (2) A seminar with presentation and discussion of the students' working papers.

The student will be required to do a practical exercise (e.g. an interview, text analysis and/or observation). Based on this exercise, the student must write a working paper. The students can choose between doing the exercise and writing the working paper individually, or together with 1-2 of their fellow students. Each student will be required to comment on another student's working paper.
Assessment: Written examination

Forms of assessment	Time	Percentage	Deadline
WRITTEN EXAMINATION	6.0 Hours	1/1	

BARN3300 Children and Development in the South

Teaching: Spring: 7.50 Cr
Language of instruction: English
Grade: Letter grade
Compulsory assignments: None
Recommended previous knowledge: See required previous knowledge.
Required previous knowledge: Admittance to the course requires a bachelor's degree in a social science or humanities discipline, or equivalent.
Learning objectives: The course examines the life experiences of children who grow up within diverse social, economic, cultural and political contexts. It is designed to provide a broad understanding of the complex ways in which children fare in their lives in most parts of the majority South.
Academic content: Reflecting on issues of social relevance, the course moves beyond stereotypes to challenge conventional assumptions of childhoods and youth by looking at the changing social and cultural contexts of growing up. It explores the meanings and values of children themselves, children together with their families, family types and structures, socialization, child-care and child-raising practices, youth transitions and social becoming in the context of social change etc.
Specific topics covered might include:
* Growing up in multi-generational context.
* Child labour in developing countries.
* Education for girls and boys: agents, role and benefits.
* Children, migration and social change.
* Politics of orphanhood.
* Children in difficult circumstances: street children, orphans, refugee children etc.
* Children as social and political participants.
* Youth and political activism.
* Social transitions to adulthood.
* Children, violence and armed conflicts.

Course materials: Information will be given at the beginning of the semester.
Teaching methods and activities: Total lecture hours: 20 hours, total seminar hours: up to 12 hours. The course consists of: (1) A common introduction with lectures. (2) A seminar with presentation and discussion of the students' term papers. The students can choose between writing their term paper individually, or together with 1-2 of their fellow students. Each student will be required to comment on another student's term paper.
Assessment: Written assignment/written examination

Forms of assessment	Time	Percentage	Deadline
WRITTEN EXAMINATION	4.0 Hours	2/3	
ASSIGNMENT		1/3	

BARN3400 Preparatory Course, Master's Thesis

Teaching: Spring: 7.50 Cr
Language of instruction: English
Grade: Pass/Fail
Compulsory assignments: None
Recommended previous knowledge: See required previous knowledge.
Required previous knowledge: The course is only for students accepted at MPhil in Childhood Studies.
Learning objectives: To generate basic knowledge of how to prepare and design scientific research projects. The students shall develop a research design, including an empirical study, which they are going to conduct as their master's thesis.
Academic content: The course will prepare the students for their work with the master's thesis. The various stages of the research process will be introduced, such as defining a research problem, how to make use of acquired knowledge of theory and methodology, how to analyse etc. During the course the students shall develop their master's projects. Each student's project will be discussed at the course. By the end of the course, a final project description shall be handed in.
Course materials: Information will be given at the beginning of the semester.
Teaching methods and activities: Total seminar hours: up to 18 hours. Form of assessment: Approved oral presentation and project description.
Assessment: Oral examination/Report

Forms of assessment	Time	Percentage	Deadline
ORAL EXAMINATION		1/2	
WRITTEN REPORT		1/2	

BARN3500 Historical Perspectives on Childhood

Teaching: Autumn: 7.50 Cr
Language of instruction: English
Grade: Letter grade
Compulsory assignments: Approved working paper and oral presentation
Recommended previous knowledge: See required previous knowledge.
Required previous knowledge: Admittance to the course requires a bachelor's degree in a social science or humanities discipline, or equivalent.
Learning objectives:
* To generate knowledge about the historical construction of childhood and children's everyday lives and how childhood has changed with time and space.
* To provide an overview of essential research perspectives in historical studies of children and childhood.
* To introduce key debates concerning the research and changing perspectives on childhood and children's everyday life in history.
Academic content: The course addresses the social and cultural construction of childhood and children's lives through history from early modern times to our days in the western world. Historical changes of childhood and children's lives will be interpreted within the framework of family, work-life and school. Intergenerational transfer is central in childhood history as well as in historical development in general and will be addressed. Implication of social structures on children's agency in history will also be discussed, as will themes such as gender, class, identity and ethnicity. Theoretical perspectives on child labour and children's agency and participation in work-life and society will be challenged and discussed.
Course materials: Information will be given at the beginning of the semester.
Teaching methods and activities: Total lecture hours: 20 hours, total seminar hours: up to 12 hours. The course consists of: (1) A common introduction with lectures. (2) A seminar with presentation and discussion of the students' working papers. The students can choose between writing their working paper individually, or together with 1-2 of their fellow students. Each student will be required to comment on another student's working paper.
Assessment: Written examination

Forms of assessment	Time	Percentage	Deadline
WRITTEN EXAMINATION	4.0 Hours	1/1	

BARN3900 Master's Thesis

Teaching: 1st sem. autumn, 2nd sem. spring: 60.0 Cr
Language of instruction: English
Grade: Letter grade
Compulsory assignments: Empirical study, oral presentation, chapter drafts, individual supervision
Recommended previous knowledge: See required previous knowledge.
Required previous knowledge: The course is only for students accepted at MPhil in Childhood Studies.
Learning objectives: To give the students training in carrying out a scientific study related to children and childhood.
Academic content: The students themselves choose their topic for the master's thesis, which shall be an autonomous, scientific study based on concrete research questions related to children and childhood. The thesis should be 80-120 pages (Times New Roman 12, space 1.5).
The thesis should normally include an empirical study. The data collection is expected to be finished by the middle of the 3rd semester. The students are recommended to include the summer between 2nd and 3rd semester for data collection, if necessary.
The thesis is expected to be completed within four terms from the admission to the programme. Supervision will not be given beyond this.
Course materials: Information will be given at the beginning of the semester.
Teaching methods and activities: The students shall take part in a seminar with emphasis on theoretical and practical issues related to the writing of a master's thesis. All students shall present their thesis work at the seminar. The students are also expected to hand in chapter drafts during their writing period, and they will be given individual supervision.
Forms of assessment: Master's thesis and oral exam. The oral exam is used to adjust the grade given for the thesis.
Assessment: Thesis

Forms of assessment	Time	Percentage	Deadline
THESIS		1/1	

Department of Geography

GEOG3506 Geography, Health and Development

Teaching: Autumn: 7.50 Cr
Language of instruction: English
Credit reduction: SVGEO331: 7.50 Cr
Grade: Letter grade
Compulsory assignments: Approved term paper and presentation
Recommended previous knowledge: See formal requirements.
Required previous knowledge: GEOG1000-1006 or the equivalent or bachelor's degree in social sciences.
Learning objectives: The course aims to give a broad overview of geographical perspectives on health with two main focuses:

1) Health status, disease/injury and risk/risk factors.
2) Geography of health services at different levels, with emphasis on demand and use, availability and accessibility, prevention, and treatment.
Academic content: The main emphasis of the course is on the situation in developing countries, but more general development trends in health and health services in different parts of the world are also covered. As well as a common core curriculum, two in-depth courses (curriculum variations) are offered: one that studies developing countries' perspectives in more detail, and a guideline for studying westernized countries (among which Norway is central). The course covers studies in quantitative and qualitative method traditions.
Part of the study is based on student's own reading which forms the foundation for carrying out the semester essay. This is presented at a seminar. A seminar is also arranged on searching for medical and health literature in libraries and databases (3 hours). The semester essay and presentation must be approved before the written examination can be taken.
Course materials: Given at the start of the semester.
Teaching methods and activities: Teaching method and activities: 20 hours lectures, 8 hours seminars.
Compulsory activity: Approved term paper and presentation.
Form of assessment: 4 hour written exam.
Assessment: Written examination

Forms of assessment	Time	Percentage	Deadline
WRITTEN EXAMINATION	4.0 Hours	1/1	

GEOG3515 Environment, Development and Changing Rural Livelihoods
Teaching: Autumn: 7.50 Cr
Language of instruction: English
Grade: Letter grade
Compulsory assignments: Group work and presentation
Required previous knowledge: Bachelor in Geography or other social science. Other relevant qualifications can be accepted upon approval by the Department of Geography.
Learning objectives: The aim of the course is to give student an understanding of the links between development, environment and environmental change and (rural) livelihood in African and Asian societies.
Academic content: Among the topics covered by the course: *History of geographical thought: From environmental determinism to political ecology. *Social nature; Social constructivism and environmental narratives. *Institutions, norms and collective action and the idea of the 'community' as basis for natural resource management. *Hazards and vulnerability. Vulnerability; a useful concept or just another way of labelling?: Vulnerability analysis in practice. *Environmental conservation and development; from 'Fortress conservation' to 'Conservation and development'? *Changing rural livelihoods and livelihood analysis; from farm to non-farm and implications for the rural environments. *Environment and conflicts. The 'Environment' as basis for conflicts.
Teaching methods and activities: Lectures: 14 hours. Group work and presentations (obligatory).
Assessment: Written examination

Forms of assessment	Time	Percentage	Deadline
WRITTEN EXAMINATION	4.0 Hours	1/1	

GEOG3516 Humanitarianism: Theory and Practice
Teaching: Autumn: 7.50 Cr
Language of instruction: English
Grade: Letter grade
Compulsory assignments: Assignment and introductory seminar
Recommended previous knowledge: The course is given at MA-level, a background equivalent to Bachelor in social sciences or extensive field experiences is recommended.
Learning objectives: This course will examine the principles underpinning humanitarian aid and investigate how they are being realized in the field. Embedded in humanitarian action are a number of contentious issues regarding the relationships between political aims of donors and host governments and the people concerned. The course will stress the relationship between theory and practice and how to deal with operational dilemmas on the ground.
Academic content: The lectures will introduce principles and theories of humanitarian action; the various actors involved and the relationship between them; the emergence of humanitarian regimes; the relationship between political development and humanitarian practice; humanitarianism and forced migration; gender, ethnicity and humanitarian challenges; ethical dilemmas, aid conditionality and the Do No Harm and Relief to Development concepts. The lectures are internet based with one day compulsory introductory seminar. For the students present at NTNU some seminars relating to the internet based lectures will be held. Assignments are approved/not approved.
Teaching methods and activities: Teaching method: Internet based, equivalent to 16 hours, 1-day compulsory introductory seminar, seminars for the students present at NTNU.
Compulsory activity: Assignments and introductory seminar.
Form of assessment: Home exam (5 days).
Assessment: Home examination

Forms of assessment	Time	Percentage	Deadline
HOME EXAMINATION	5.0 Days	1/1	

GEOG3561 Gender and Social Change

Teaching: Autumn: 7.50 Cr
Language of instruction: English
Credit reduction: SVGEO361: 7.50 Cr
Grade: Letter grade
Compulsory assignments: None
Required previous knowledge: For Norwegian students: Bachelorgrad or 'mellomfag' in Geography. Other relevant qualifications can be accepted if approved by the Department. For International students: Bachelor degree in social science.
Learning objectives: The course offers an introduction to the main themes of international social scientific research on gender, and provides a theoretical platform for further studies on gender-related issues.
Academic content: The course offers an introduction to the main themes of international social scientific research on gender, and provides a theoretical platform for further studies on gender-related issues. The course seeks to combine an interdisciplinary and subject-specific approach. It aims at outlining different perceptions of gender within different social scientific traditions. Theoretical and methodological problems related to the use of gender as an analytical category and how these are manifested in social scientific research are examined. The course also includes presentations of empirical material from gender-specific research within the field of geography and other social sciences.
Teaching methods and activities: Teaching method: 16 hours lectures and seminars with active involvement from students. Form of assessment: Written exam (4 hours).
Assessment: Written examination

Forms of assessment	Time	Percentage	Deadline
WRITTEN EXAMINATION	4.0 Hours	1/1	

Department of Psychology

PSY3082 Relational and Cultural Aspects of Development

Teaching: Autumn: 15.0 Cr
Language of instruction: English
Grade: Pass/Fail
Compulsory assignments: None
Recommended previous knowledge: See requirements.
Required previous knowledge: Requirements: Bachelor's degree in Psychology or equivalent. Students admitted to MPhil in Childhood Studies are exempted from this requirement.
Learning objectives: The course will provide the basis conceptual tools for the understanding of interpersonal, social, and cultural aspects of change processes underlying human development.
Academic content: In the enlarged sense already described above this basic course on human development comprises four blocks, which introduce selected theoretical and empirical themes pivotal to a comprehensive understanding of human change processes. Specifically, they will provide a basis for the understanding of interpersonal, social and cultural processes underlying the development of individuals and groups. The detailed content of each block might vary from one semester to another.
Course materials: Syllabus: 800 pp.
Teaching methods and activities: Teaching semester: Autumn.
Semester cycle: Flexible cycle, graduate level.
Teaching methods and activities: Block teaching: lectures and seminars.
Examination: Four papers (Pass/Fail).
Deadlines: Submission of papers 2 weeks after end of block teaching.
Assessment: Written assignment

Forms of assessment	Time	Percentage	Deadline
ASSIGNMENT		1/1	

PSY3085 Specialization in Relational and Cultural Aspects of Development

Teaching: Spring: 7.50 Cr
Language of instruction: English
Credit reduction: SANT3506 'Specialization in Relational and Cultural Aspects of Development' (7,5 cr)
Grade: Letter grade
Compulsory assignments: None
Recommended previous knowledge: See formal requirements.
Admission restrictions: Yes.
Required previous knowledge: Bachelor's degree in Psychology or equivalent.
Learning objectives: The course should - provide an opportunity for both theoretical and practical knowledge in interpersonal, social, and cultural aspects of human change processes by participation in ongoing research, - provide experience in carrying out projects in the selected areas, - provide exercise in oral presentation of research results.
Academic content: The purpose of the course is to develop and integrate theoretical, practical and methodological knowledge in interpersonal, social, and cultural aspects of development. A number of projects will be offered, of which the student should choose two, ensuring that two different methodological approaches will be covered. To maintain a fairly equal distribution of students among the projects, it might not be possible to guarantee that all students will have their first choices. In accord with a teacher, students may also propose a project of their own.

Course materials: Syllabus: 400 pp.
Teaching methods and activities: Teaching semester: Spring Semester cycle: Flexible cycle, graduate level. Teaching methods and activities: Block teaching: lectures and seminars. Examination: Two paper presentations, written and oral. Letter grades on each paper. The papers are weighted 1/2 - 1/2 in final grade. Deadlines: Submission of papers 2 weeks after end of block teaching.
Assessment: Written assignment

Forms of assessment	Time	Percentage	Deadline
ASSIGNMENT		1/2	
ASSIGNMENT		1/2	

Department of Social Anthropology

SANT3504 The Colonial and the Post-Colonial: Anthropology, History and Literature
Teaching: Autumn: 7.50 Cr
Language of instruction: Norwegian or English
Credit reduction: SVSANT340: 7.50 Cr, SVSANT342: 7.50 Cr
Grade: Letter grade
Compulsory assignments: None
Recommended previous knowledge: See formal requirements.
Required previous knowledge: Bachelor's degree or the equivalent.
Learning objectives: To develop substantial knowledge about the post-colonial critique in anthropology.
Academic content: The course discusses different constructions of the relationship between "us" and "them" in anthropology, history and literature. The conceptualization of this relationship is studied in three historic periods: the great discoveries, colonialization and the post-colonial period. Themes examined include: orientalism, primitivism, the formation of the subject, identity and alterity, cultural authenticity and hybridizing, globalizing and ethnic incorporation, hegemony and counter discourse.
Teaching methods and activities: Lectures/seminars (approx. 18 hours).
The course may be offered in English if necessary. If one exchange student is English speaking and registers within the beginning of the semester, teaching in English can be guaranteed.
4-hour written exam.
Assessment: Written examination

Forms of assessment	Time	Percentage	Deadline
WRITTEN EXAMINATION	4.0 Hours	1/1	

CREDIT ADJUSTMENT DUE TO OVERLAP IN CONTENT

BARN3100	BARN3001	7.5 credits
BARN3100	BARN3101	7.5 credits
BARN3100	BARN3102	7.5 credits
BARN3101	BARN3001	7.5 credits
BARN3200	BARN3002	7.5 credits

MPHIL PROGRAMME IN DEVELOPMENT STUDIES

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 11.01. 2007

The Master in Development Studies 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.

The programme is open to both foreign and Norwegian students.

ADMISSION REQUIREMENTS

Applicants should hold a Bachelor of Social Science The degree should 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 teaching language is English, and the applicants must document their English proficiency by achieving one of the following:

- Pass in the foundation course (“grunnkurs”) in English at a Norwegian Upper Secondary School.
- TOEFL-test with a minimum of 550 points. (213 computer based test)
- IELTS-test with 6,0 points or better

Exceptions from this requirement can be given for certain groups of applicants under the guidelines determined by the Faculty.

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: GEO3050 Theories of Social Change, Interdisciplinary Teamwork (EiT) and GEOG3052 Research Methodology.
Students can choose electives worth 37,5 credits from a number of courses offered by the Department of Geography and other departments. Most of the electives will be offered in the autumn term. Courses other than those listed below can be chosen as electives if approval is given by the Department of Geography.

CORE COURSES:

Code	Title	Cr	Term	Restricted admission
GEOG3050	Theories of Social Change	15	Autumn /Spring	No
GEOG3052	Research Methodology	15	Spring	No
EiT	Interdisciplinary Teamwork	7,5	Spring	
GEOG3920	Master's Thesis	45	Autumn /Spring	Yes

ELECTIVES:

Code	Title	Cr	Term	Restricted admission
GEOG3505*	Landscape and planning	15	Autumn	No
GEOG3506*	Geography, Health and Development	7,5	Autumn	No
GEOG3510*	Geographical Information Systems (GIS) – principles and application	15	Autumn	No
GEOG3511*	Remote Sensing	15	Autumn	No
GEOG3515*	Environment, development and changing rural livelihoods	7,5	Autumn	No
GEOG3516*	Humanitarianism: theory and practice	7,5	Autumn	No
GEOG3561*	Gender and Social Change	7,5	Autumn	No
AAR4945*	Planning and Construction in Developing Countries	7,5	Spring	No
BARN3300*	Childhood and Development in the South	7,5	Spring	No

*Courses will only be given if a minimum number of students have signed up for them

MPhil in Development Studies

Semester	Title (15 cr)		Title (15 cr)
4. Term/Spring	GEOG3920		
3. Term/Autumn	GEOG3920		Electives (15 credits)
2. Term/Spring	GEOG3050	EiT	GEOG3052
1. Term/Autumn	GEOG3050	Electives (22,5 credits)	

Candidates are expected to use the summer between the second and third term to collect data and conduct fieldwork for their thesis. The thesis is expected to be completed within four terms from admission to the course. Supervision will not be given beyond this. The thesis must be written in English.

COURSE PLAN

AAR4945 Planning and Construction in Developing Countries

Teaching: Spring: 7.50 Cr
Language of instruction: English
Grade: Letter grade
Compulsory assignments: None
Required previous knowledge: The course gives priority to course AAR4525 Urban Ecological Planning in Developing Countries. Project Work, and course AAR4820 Urban Ecological Planning. Theory, and AAR4816 Urban Ecological Planning, Method.
Learning objectives: - The course is to give an introduction to basic preconditions and applicable knowledge for carrying out planning, infrastructure and construction activity on a sustainable basis in developing countries.
- Methods for project-planning of developing measures are to be mastered and practised.
Academic content:
- Alternative theories of development, "eco-development" and principles for territorial social development and planning.
- Settlement and housing problems, and politics in developing countries.
- The role of infrastructure in development and urban planning.
- Construction and use of alternative materials in developing countries.
- Cultural continuity and diversity in development.
- Planning during crises and post-catastrophe planning.
- The roles of CBOs, NGOs and INGOs in development.
- Participant-, problem-, and goal-based project-planning methods (LFA) are to be mastered and applied in group work. The project proposals are to written according to UN/NORAD template.
- Project evaluation.
Teaching methods and activities: The course is given in cooperation with several departments at the Faculty of Architecture and Fine Art, the Faculty of Engineering Science and Technology, and the Faculty of Social Science and Technology Management. Weight is placed on interdisciplinary seminars with introductory speakers from other faculties and specialists with experience in development-related issues. Case studies are presented and discussed. One exercise is to be carried out as group work.
The course is held together with AAR4230.
Compendium with course literature.
Assessment: Written/Exercises

Forms of assessment	Time	Percentage	Deadline
WRITTEN EXAMINATION	5.0 Hours	75/100	
APPROVED EXERCISES		25/100	

BARN3300 Children and Development in the South

Teaching: Spring: 7.50 Cr
Language of instruction: English
Grade: Letter grade
Compulsory assignments: None
Recommended previous knowledge: See required previous knowledge.
Required previous knowledge: Admittance to the course requires a Bachelor’s degree in a social science or humanities discipline, or equivalent.
Learning objectives: The course examines the life experiences of children who grow up within diverse social, economic, cultural and political contexts. It is designed to provide a broad understanding of the complex ways in which children fare in their lives in most parts of the majority South.
Academic content: Reflecting on issues of social relevance, the course moves beyond stereotypes to challenge conventional assumptions of childhoods and youth by looking at the changing social and cultural contexts of growing up. It explores the meanings and values of children themselves, children together with their families, family types and structures, socialization, child-care and child-raising practices, youth transitions and social becoming in the context of social change etc.

Specific topics covered might include:
* Growing up in multi-generational context.
* Child labour in developing countries.
* Education for girls and boys: agents, role and benefits.
* Children, migration and social change.
* Politics of orphanhood.
* Children in difficult circumstances: street children, orphans, refugee children etc.
* Children as social and political participants.
* Youth and political activism.
* Social transitions to adulthood.
* Children, violence and armed conflicts.
Course materials: Information will be given at the beginning of the semester.
Teaching methods and activities: Total lecture hours: 20 hours, total seminar hours: Up to 12 hours. The course consists of:

(1) A common introduction with lectures. (2) A seminar with presentation and discussion of the students' working papers. The students can choose between writing their working paper individually, or together with 1-2 of their fellow students. Each student will be required to comment on another student's working paper.

Assessment:

Forms of assessment	Time	Percentage	Deadline
WRITTEN EXAMINATION	4.0 Hours	2/3	
ASSIGNMENT		1/3	

GEOG3050 Theories of Social Change

Teaching: 1st sem. autumn, 2nd sem. spring: 15.0 Cr
Language of instruction: English
Credit reduction: SVGEO350: 15.0 Cr, GEOG3504: 7.50 Cr
Grade: Letter grade
Compulsory assignments: Assignment, seminar presentation and term paper
Required previous knowledge: Bachelor in social science. Other relevant qualifications can be accepted upon approval by the Department of Geography
Learning objectives: Students shall broaden their knowledge of theories of social change through an introduction to different analytical perspectives in development theory and practise.
Academic content: GEOG 3050, Theories of Social Change and Development, is compulsory for students at the MPhil in Development Studies. The course serves as an introduction to the main theme of the MPhil programme. Students shall broaden their knowledge of theories of social change and development. Different theories will be introduced and examined with respect to key concepts, perspectives and key development challenges of our times such as poverty alleviation and growth, globalisation and marginalisation, gender and development, civil society mobilisation and other post-development discourses. The course draws on a wide range of practical and empirical knowledge, as the lecturers represent several disciplines within the social sciences and many have cross-cultural experience.
During the autumn term the course consists of lectures and one compulsory assignment, while the spring term consists of seminars/group work and term paper writing. The term paper should serve as an epistemology paper for the thesis and should be presented at a final seminar (compulsory).
Course materials: Will be given when the semester starts.
Teaching methods and activities: Lectures, seminars and term paper. Exam: written exam 6 hours (50%) and term paper (50%)
Assessment: null

Forms of assessment	Time	Percentage	Deadline
WRITTEN EXAMINATION	6 hours	1/2	
ASSIGNMENT		1/2	

GEOG3052 Research Methodology

Teaching: Spring: 15.0 Cr
Language of instruction: English
Credit reduction: SVGEO355: 15.0 Cr, GEOG3004: 7.50 Cr
Grade: Letter grade
Compulsory assignments: Field trip 7-10 days (incl. preparations, compulsory). Term paper
Learning objectives: The aim of the course is twofold. One main goal is to prepare the student for using methodology in his/her master thesis. The other main goal is to give the students skills and experiences in a fieldwork situation through a common field course.
Academic content: The course is comprised of four parts: (1) a common part, (2) an elective part in which students choose a qualitative or quantitative module, (3) a field course, and (4) an assignment. In the common part, emphasis is placed on developing a critical and reflexive attitude to the choice and usage of different research designs. The common part gives an overview of the possibilities and limitations of different types of data and methods for collecting and analysing data.
In the common part, all students must take part in group work based on designing and using a questionnaire, and will present their work in a seminar.
Students then choose either the qualitative or the quantitative module. Lectures, seminars and practicals will to a large extent be shared with Master of Geography students.
In the qualitative module, students will be trained in using qualitative methods such as different types of interview, observation and text analysis. The tuition comprises lectures, seminars and assignments. The assignments will provide practical training in different techniques for collecting qualitative data and analysis, reflection on ethical approaches to problems, and the communication of such data.
The quantitative module gives a closer presentation of quantitative research schemes, with a particular focus on statistical analysis of available data. Also included is the use of a statistical software package (SPSS) for analysis of data. Research design based on covariance and regression will be presented, as will other analytical techniques based on the students' particular needs. Students must carry out exercises in quantitative techniques which are relevant for their Master's thesis.
The methodology in both modules is further connected to a field course, in which students work in groups on particular topics. The purpose of the field course is to put into practice the use of methodology, and the group work will form part of a common field course report.
In the concluding part of the course, students will prepare an assignment in which they reflect on use of methodology (based on qualitative and/or qualitative methods), central geographical concepts and development theory in their own master's thesis.
Course materials: Will be given when the semester starts.

Teaching methods and activities: Lectures: 14 hours
Seminars: 12 hours
Field course:7-10 days (incl. preparations)
Requirement: Approved field course with report and assignments/exercises
Exam: Oral exam
Assessment: Oral

Forms of assessment	Time	Percentage	Deadline
ORAL EXAMINATION		1/1	

GEOG3505 Landscape and Planning

Teaching: Autumn: 15.0 Cr
Language of instruction: English
Credit reduction: SVGEO323: 7.50 Cr, SVGEO326: 7.50 Cr, SVGEO362: 7.50 Cr
Grade: Letter grade
Compulsory assignments: Approved term paper/project work.
Recommended previous knowledge: See formal requirements.
Required previous knowledge: Bachelor in Geography. Other relevant qualifications can be accepted upon approval by the Department of Geography
Learning objectives: The course aims to give insight into theoretical and methodological problems in connection with landscape seen in relation to planning.
Academic content: The course studies the concept of landscape, landscape values, and theoretical and methodological problems in landscape planning and management. It is offered to students on the Department's two MA degree programs. Students taking the MPhil in Development Studies write an individual semester essay based on the course literature. Students taking the MA in Geography participate in a project where, through fieldwork, interviews and document analysis, they analyse a concrete planning situation in which landscape and environmental values are involved. The project is normally undertaken as group work. The aim of the project is to give insight into how and to what extent consideration of the landscape and environment is included in planning and management and to illustrate what problems relating to landscape and environment are encountered in the general planning process. The lectures will normally be given in English. For students taking the Norwegian master's course, the project is conducted in Norwegian, and the group report will normally be written in Norwegian.
Teaching methods and activities: Teaching method and activities: 30 hours lectures.
Compulsory activity: Approved term paper/project work.
Form of assessment: Oral exam.
Assessment: Oral

Forms of assessment	Time	Percentage	Deadline
ORAL EXAMINATION		1/1	

GEOG3506 Geography, Health and Development

Teaching: Autumn: 7.50 Cr
Language of instruction: English
Credit reduction: SVGEO331: 7.50 Cr
Grade: Letter grade
Compulsory assignments: Approved term paper and presentation
Recommended previous knowledge: See formal requirements.
Required previous knowledge: GEOG1000-1006 or the equivalent or Bachelor's degree in social sciences.
Learning objectives: The course aims to give a broad overview of geographical perspectives on health with two main focuses:
1) Health status, disease/injury and risk/risk factors.
2) Geography of health services at different levels, with emphasis on demand and use, availability and accessibility, prevention, and treatment.
Academic content: The main emphasis of the course is on the situation in developing countries, but more general development trends in health and health services in different parts of the world are also covered. As well as a common core curriculum, two in-depth courses (curriculum variations) are offered: one that studies developing countries' perspectives in more detail, and a guideline for studying westernized countries (among which Norway is central). The course covers studies in quantitative and qualitative method traditions.
Part of the study is based on the student's own reading which forms the foundation for carrying out the semester essay. This is presented at a seminar. A seminar is also arranged on searching for medical and health literature in libraries and databases (3 hours). The semester essay and presentation must be approved before the written examination can be taken.
Course materials: Given at the start of the semester.
Teaching methods and activities: Teaching method and activities: 20 hours lectures, 8 hours seminars.
Compulsory activity: Approved term paper and presentation.
Form of assessment: 4 hour written exam.
Assessment: Written

Forms of assessment	Time	Percentage	Deadline
WRITTEN EXAMINATION	4.0 Hours	1/1	

GEOG3510 Geographical Information Systems (GIS)

Teaching: Autumn: 15.0 Cr
Language of instruction: English
Credit reduction: SVGEO328: 15.0 Cr
Grade: Letter grade
Compulsory assignments: Approved assignments and project work.
Recommended previous knowledge: Mathematics (linear algebra), statistics or data processing (programming, database, graphic data processing) equivalent to c.7.5 credits.
Required previous knowledge: Minimum 82,5 credits.
Learning objectives: The course aims to provide advanced knowledge of geographical information systems (GIS), including a comprehensive overview of the use of GIS functions. Students will become acquainted with how GIS can be used within both social scientific research (the use of GIS in conflict and peace research) and physical sciences research (the use of GIS in research on risks and consequences of landslides, flooding and other geohazards).
Academic content: Different types of data collection, processing and presentation of geographic data with the help of GIS will be covered. The central components of the course include GIS-based modelling (geoprocessing) and ethical considerations.
During the semester students will carry out several in-depth exercises as well as a larger project assignment. These must be approved before the students can sit for the examination, and they will count towards the determination of the final grade awarded for this course.
Teaching methods and activities: Teaching method and activities: 22 hours lectures, 48 hours practical and project.
Compulsory activity: Approved assignments and project work.
Form of assessment: Written exam, results from exercises.
Assessment: Written/Exercises

Forms of assessment	Time	Percentage	Deadline
WRITTEN EXAMINATION	6.0 Hours	1/2	
APPROVED EXERCISES		1/2	

GEOG3511 Remote Sensing

Teaching: Autumn: 15.0 Cr
Language of instruction: English
Credit reduction: SVGEO329: 15.0 Cr
Grade: Letter grade
Compulsory assignments: Approved assignments and project work
Recommended previous knowledge: Mathematics (linear algebra), statistics or data processing (programming, database, graphic data processing) equivalent to c.7.5 credits.
Required previous knowledge: Bachelor in Geography or other social science. Other relevant qualifications can be accepted upon approval by the Department of Geography
Learning objectives: The aim of the course is to give an introduction in the use of satellite images in approaches to geographical problems.
Academic content: The course provides a comprehensive overview of how data collection from satellites is made. Students are introduced to different sources (different satellites), methods for processing and correcting digital images, and different application possibilities for digital satellite images, aerial photographs and orthophotos. An important element is explanation of how the digital images can be integrated in a geographical information system (GIS). Students are given an introduction to specialist program packages such as Idrisi.
During the semester students undertake a number of short exercises together with a larger project. These must be approved before the students can sit for the examination.
Teaching methods and activities: Teaching method and activities: 24 hours lectures, 24 hours practical and project.
Compulsory activity: Approved assignments and project work.
Form of assessment: Oral exam.
Assessment: Oral

Forms of assessment	Time	Percentage	Deadline
ORAL EXAMINATION		1/1	

GEOG3515 Environment, Development and Changing Rural Livelihoods

Teaching: Autumn: 7.50 Cr
Language of instruction: English
Grade: Letter grade
Compulsory assignments: Group work and presentation
Required previous knowledge: Bachelor in Geography or other social sciences. Other relevant qualifications can be accepted upon approval by the Department of Geography.
Learning objectives: The aim of the course is to give student an understanding of the links between development, environment and environmental change and (rural) livelihood in African and Asian societies.
Academic content: Among the topics covered by the course: History of geographical thought: From environmental determinism to political ecology. Social nature; Social constructivism and environmental narratives. Institutions, norms and collective action and the idea of the "community" as basis for natural resource management. Hazards and vulnerability. Vulnerability; a useful concept or just another way of labelling?: Vulnerability analysis in practice. Environmental conservation and development; from "Fortress conservation" to "Conservation and development"? Changing rural livelihoods

and livelihood analysis; from farm to non-farm and implications for the rural environments. Environment and conflicts. The 'Environment' as basis for conflicts.
Teaching methods and activities: Lectures: 14 hours. Group work and presentations (obligatory)
Assessment: Written

Forms of assessment	Time	Percentage	Deadline
WRITTEN EXAMINATION	4.0 Hours	1/1	

GEOG3516 Humanitarianism: Theory and Practice
Teaching: Autumn: 7.50 Cr
Language of instruction: English
Grade: Letter grade
Compulsory assignments: Assignment and introductory seminar
Recommended previous knowledge: The course is given at MA-level, a background equivalent to Bachelor in social sciences or extensive field experiences is recommended.
Learning objectives: This course will examine the principles underpinning humanitarian aid and investigate how they are being realized in the field. Embedded in humanitarian action are a number of contentious issues regarding the relationships between political aims of donors and host governments and the people concerned. The course will stress the relationship between theory and practice and how to deal with operational dilemmas on the ground.
Academic content: The lectures will introduce principles and theories of humanitarian action; the various actors involved and the relationship between them; the emergence of humanitarian regimes; the relationship between political development and humanitarian practice; humanitarianism and forced migration; gender, ethnicity and humanitarian challenges; ethical dilemmas, aid conditionality and the Do No Harm and Relief to Development concepts. The lectures are internet based with one day compulsory introductory seminar. For the students present at NTNU some seminars relating to the internet based lectures will be held. Assignments are approved/not approved.
Teaching methods and activities: Internet based, equivalent to 16 hours, 1-day compulsory introductory seminar, seminars for the students present at NTNU.
Compulsory activity: Assignments and introductory seminar
Form of assessment: Home exam (5 days).
Assessment: Home examination

Forms of assessment	Time	Percentage	Deadline
HOME EXAMINATION	5.0 Days	1/1	

GEOG3561 Gender and Social Change
Teaching: Autumn: 7.50 Cr
Language of instruction: English
Credit reduction: SVGEO361: 7.50 Cr
Grade: Letter grade
Compulsory assignments: None
Required previous knowledge: For Norwegian students: Bachelorgrad or 'mellomfag' in Geography. Other relevant qualifications can be accepted if approved by the Department. For International students: Bachelor degree in social science.
Learning objectives: The course offers an introduction to the main themes of international social scientific research on gender, and provides a theoretical platform for further studies on gender-related issues.
Academic content: The course offers an introduction to the main themes of international social scientific research on gender, and provides a theoretical platform for further studies on gender-related issues. The course seeks to combine an interdisciplinary and subject-specific approach. It aims at outlining different perceptions of gender within different social scientific traditions. Theoretical and methodological problems related to the use of gender as an analytical category and how these are manifested in social scientific research are examined. The course also includes presentations of empirical material from gender-specific research within the field of geography and other social sciences.
Teaching methods and activities: Teaching method: 16 hours lectures and seminars with active involvement from students.
Form of assessment: Written exam (4 hours)
Assessment: Written

Forms of assessment	Time	Percentage	Deadline
WRITTEN EXAMINATION	4.0 Hours	1/1	

GEOG3920 Master's Thesis in Development Studies, specialising in Geography
Teaching: 1st sem. autumn, 2nd sem. spring: 45.0 Cr
Language of instruction: English
Grade: Letter grade
Compulsory assignments: None
Required previous knowledge: This course is only for students who are taking the MPhil in Development Studies.
Learning objectives: The aim of the course is to give the students training in doing a substantial individual research project.
Academic content: The student must prepare a project proposal of at least 5 pages before November 1. in the first term. On the basis of the project proposal, a faculty member will be appointed as academic supervisor in accordance with the guidelines approved by the Board of the Department. The supervisor must be kept informed about the progress of the writing. The thesis consists of a scientific presentation of a chosen topic. The thesis should be 90 - 100 pages (Times Roman 12/ spacing 1.5/ approximately 40.000 words).

Teaching methods and activities: Seminars with emphasis on theoretical and practical issues related to the writing of a master's thesis will be held during the first and the second year. Students are expected to present their thesis work for fellow students and faculty members at 2-3 seminars. It is expected that students will need a full academic year to complete the thesis. It is recommended that students start to work on their thesis in their second term.
Exam: Thesis and oral. The oral exam is used to adjust the grade given for the thesis.
Assessment: Thesis

Forms of assessment	Time	Percentage	Deadline
THESIS		1/1	

CREDIT ADJUSTMENT DUE TO OVERLAP IN CONTENT

GEOG3050	SVGEO350	15 credits
GEOG3050	GEOG3504	7,5 credits
GEOG3051	SVGEO351	15 credits
GEOG3004	GEOG3052	7,5 credits
GEOG3505	SVGEO323	7,5 credits
GEOG3505	SVGEO326	7,5 credits
GEOG3505	SVGEO362	7,5 credits
GEOG3506	SVGEO331	7,5 credits
GEOG3510	SVGEO328	15 credits
GEOG3511	SVGEO329	15 credits
GEOG3561	SVGEO361	7,5 credits
GEOG3052	SVGEO355	15 credits

MASTER OF PHILOSOPHY IN HUMAN DEVELOPMENT

Approved by the Board at NTNU 09.11.04 2004, with changes made by the Faculty of Social Sciences and Technology Management 09.01.2007

AIM

The aim of this programme is to provide a broad, interdisciplinary knowledge-base for disciplines concerned with human change throughout the life span. To fulfil this aim, the Department of Psychology offers this programme in collaboration with other departments at NTNU. It interfaces related themes from Psychology and a wide range of other disciplines. Its distinguishing feature is the inclusion of different theoretical approaches and a variety of methodological stances. English, both orally and written, will be the language of instruction.
The over-arching concerns throughout the course include but are not limited to:

The process of change within the individual.

Human change is multi-modal, always comprising the multi-facted dimensions of human existence. Nowadays, the position is widely accepted that a general developmental perspective for understanding human change must include the full spectrum of perspectives within Psychology –for example, perception-action coupling, motor skills, personality, and social psychology. Likewise, it must dialogue with research findings of allied disciplines, such as Geography, Anthropology, Sociology, Human Movement Science, Architecture, Health Science and Medicine.

The process of human change across all phases of the life course.

Developmental psychology has traditionally been largely synonymous with child psychology. However, reaching chronological adulthood does not halt development and human change. Today it is widely accepted that an individual develops through his or her entire life.

The process of societal change, and how it affects – and is affected by – individuals

Change is not a one-way process, where a few factors cause a few outcomes. The processes of change follow the rules of multi-causality and multi-finality. This means that many agents interact in a dynamic way. Therefore, the impacts of shifting individual coping styles upon society cannot be separated or isolated from the way upheavals in society impact individual adjustment. So it is necessary to study the effect human change has on society as well as the ways individuals cope with societal change.
The central theme of this programme is change within the individual (ontogenesis) and between individuals, but also micro genetic change, that is, change in the real time deployment of behaviour in particular areas of human activity, for example, skills, habits, or communicative interaction.

Ontogenesis:

Human beings have to cope with change throughout their lifespan. Some of these changes are biological-maturational, such as growing up and learning to move, puberty, menarche and constant body changes related to age. These changes occur for all healthy human beings within certain periods of their life. Other changes are of a normative social character, heavily influenced by the culture and historical time the individual lives in. These are changes like beginning school, marrying, becoming a parent, retirement, and so on. Finally, there are non-normative changes, challenges some individuals will meet and others not, at unpredictable points in their lifespan. These include minor challenges such as dealing with everyday experiences, new tasks in social life, work and leisure time, and significant life events, such as coping with divorce, illness or unemployment. Facing changes and dealing with them successfully is the motor of human development: the cessation of change is the beginning of stagnation. The aim of the programme is to understand and study human reactions in the face of change across the lifespan, and to find applications of this knowledge in dealing with human beings in different settings.

Microgenesis:

Change also involves development of skills, such as motor skills, social skills and skills involved in man-machine interaction. Actions develop into routines and habits emerge, both in the individual and in the interaction between individuals.
Emphasis will be put on the process of change, in contrast to traditional approaches in developmental psychology, where the outcome of change processes is the main issue. In this process the relationship between changes in the individual and changes in the environment is looked upon as a complex whole; for example, the individual's own actions may lead to changes in the environment, which, in turn, may influence the individual. In this respect the relationship between ontogenetic change and micro genetic change is a central issue.

Integration:

This programme has the ambition to give students a broad and integrated understanding of the change processes underlying human development. It is therefore important that the students get acquainted with as well intra-individual (such as biological and cognitive) change processes as inter-individual (relational, social, and cultural) change processes. Also, acquaintance with different methodological approaches pertaining to different aspects of human change processes will be emphasized. However, students may come to this programme with varying backgrounds and interests. They will be encouraged to develop their own meaningful and comprehensive plans for the study. Coordination and cooperation among the teachers as well as between teachers and the students involved will help the students to maintain integration in their individual projects.

Employment opportunities

Administration
Applied science
Research
Studies and evaluations for the public sector

ADMISSION

General information:

Sixteen students will be admitted each autumn semester. Candidates will be selected on the basis of administrative requirements complemented by a judicious assessment.

REQUIREMENTS:

Bachelor of social science in Psychology, or the equivalent. Approximately 1.5 years of university studies within Psychology, and courses within Statistics, Research Methods, and Theory of Science must be covered within the first degree. The average grade of the degree must be at least C by the Norwegian grading system, or equivalent, as decided by NTNU.
English Language Requirements: Norwegian applicants must have passed the required exam in English language ("Engelsk grunnkurs") from the Norwegian Higher Secondary School. Applicants from European or other industrialised countries, having ratified the Lisbon Convention, should document a minimum of 7 years of English as a subject from their primary and secondary school when submitting the final application form. Applicants from such countries, who have less than 7 years of English from primary and secondary school, as well as applicants from other countries must pass either the TOEFL with a minimum paper score of 550 (213 on computer based test) or IELTS with 6.0 or better. Citizens from Ireland, the UK, 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 either of these countries, attending higher secondary school or university. Exempted are also applicants from African countries with a bachelor 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. Please be aware that applicants from Asian countries with a BA degree where the language of instruction has been English are not exempted from the English language requirements.
Officially certified copies of all educational certificates, including transcripts and diplomas from all secondary school(s) and university/universities must be provided.
The faculty can make certain exceptions from some requirements.

Code	Title	Cr	Semester	Restricted admission
PSY3080	Biological and Cognitive Aspects of Development	15	Autumn	Yes
PSY3081	Research Methodology, Theories of Sciences and Ethics	15	Spring	Yes
PSY3082	Relational and Cultural Aspects of Development	15	Autumn	Yes
PSY3083	Specialization in Biological and Cognitive Aspects of Development	7,5	Spring	Yes
PSY3084	Individually Selected Texts	15	Autumn	No
PSY3085	Specialization in Relational and Cultural Aspects of Development	7,5	Spring	Yes
PSY3904	Master’s Thesis	45	Autumn and Spring	Yes

Outline of the programme

Semester	Credits		
Semester 4 Spring	PSY3904 Master’s Thesis (30 cr)		
Semester 3 Autumn	PSY3904 Master’s Thesis (15 cr)	PSY3084 Individually Selected Texts (15 cr)	
Semester 2 Spring	PSY3081 Research Methodology, Theories of Sciences and Ethics (15 cr)	PSY3085 Specialization in Relational and Cultural Aspects of Development (7,5 cr)	PSY3083 Specialization in Biological and Cognitive Aspects of Development (7,5 cr)
Semester 1 Autumn	PSY3080 Biological and Cognitive Aspects of Development (15 cr)	PSY3082 Relational and Cultural Aspects of Development (15 cr)	

COURSE DESCRIPTIONS

PSY3080 Biological and Cognitive Aspects of Development
Teaching: Autumn: 15.0 Cr
Language of instruction: English
Grade: Pass/Fail
Compulsory assignments: None
Required previous knowledge: Bachelor's degree in Psychology or equivalent.
Admission restrictions: Yes
Learning objectives: The course will provide the basis conceptual tools for the understanding of biological and cognitive aspects of change processes underlying human development.
Academic content: In the enlarged sense already described above this basic course on human development comprises four blocks, which introduce selected theoretical and empirical themes pivotal to a comprehensive understanding of human change processes. Specifically, they will provide a basis for the understanding of biological and cognitive processes underlying development of action and experience. The detailed content of each block might vary from one semester to another.
Course materials: Syllabus: 800 p

Teaching methods and activities: Teaching semester: Autumn
Semester cycle: Flexible cycle, graduate level
Teaching methods and activities: Block teaching: lectures and seminars
Examination: Four papers (Pass/Fail)
Deadlines: Submission of papers 2 weeks after end of block teaching.
Assessment: Written assignment

Forms of assessment	Time	Percentage	Deadline
ASSIGNMENT		1/1	

PSY3081 Research Methodology, Theories of Sciences and Ethics

Teaching: Spring: 15.0 Cr
Language of instruction: English
Grade: Letter grade
Compulsory assignments: None
Required previous knowledge: Requirements: Bachelor's degree in Psychology or equivalent.
Learning objectives: The course will (1) provide a foundation in theories of sciences for the choice of research methods, (2) provide insight in the ethical implications of different methodological approaches to research, (3) provide a foundation for autonomously developing and carrying out a structured interview and a questionnaire, an experimental design, a qualitative research design, and provide knowledge of width in scientific designs as a basis for adequate choice of methods and practical implementation of research projects.
Academic content: The course is an introduction to scientific research methods and their foundation in theories of sciences and ethics. Quantitative and qualitative methods are treated as equally important. The course expands and pursues selected knowledge concerning methodology that students bring with them from their Bachelor's Degree training. The basic rationales of quantitative approaches are discussed in relation to selected designs most pertinent to assessing human change processes. There is a particular emphasis on interpretation and presentation of results of the selected designs and analyses through practical exercises with SPSS.
The course also offers the basic rationale for qualitative approaches in general, and provides a thorough study of selected qualitative methods. Different techniques for collecting, structuring, and analyzing qualitative data are studied. The students will be trained in carrying out qualitative research.
The course will not cover all different quantitative and qualitative approaches. The selected approaches will be related to the specializations in human development offered by PSY3083 and PSY3085. However, the training in the selected approaches should give the student a basis for studying independently other methodological approaches they will deem relevant and useful in the future.
Course materials: Syllabus: 800 p
Teaching methods and activities: Teaching semester: Spring
Semester cycle: Flexible cycle, graduate level
Teaching methods and activities: Lectures, seminars, field work, and exercises
Syllabus: 800 p
Examination: 6 hour written exam on Quantitative Methods. One exam paper on Quantitative and Qualitative Methods, Theories of Sciences and Ethics. Letter grade on each part. Written exam and exam paper are weighted 1/2, 1/2 in the final grade.
Deadlines: Submission of paper 2 weeks after end of teaching.
Assessment:

Forms of assessment	Time	Percentage	Deadline
WRITTEN EXAMINATION	6.0 Hours	1/2	
ASSIGNMENT		1/2	

PSY3082 Relational and Cultural Aspects of Development

Teaching: Autumn: 15.0 Cr
Language of instruction: English
Grade: Pass/Fail
Compulsory assignments: None
Recommended previous knowledge: See requirements
Required previous knowledge: Requirements: Bachelor's degree in Psychology or equivalent. Students admitted to MPhil in Childhood Studies are exempted from this requirement.
Learning objectives: The course will provide the basis conceptual tools for the understanding of interpersonal, social, and cultural aspects of change processes underlying human development.
Academic content: In the enlarged sense already described above this basic course on human development comprises four blocks, which introduce selected theoretical and empirical themes pivotal to a comprehensive understanding of human change processes. Specifically, they will provide a basis for the understanding of interpersonal, social and cultural processes underlying the development of individuals and groups. The detailed content of each block might vary from one semester to another.
Course materials: Syllabus: 800 p
Teaching methods and activities: Teaching semester: Autumn
Semester cycle: Flexible cycle, graduate level
Teaching methods and activities: Block teaching: lectures and seminars
Examination: Four papers (Pass/Fail)

Deadlines: Submission of papers 2 weeks after end of block teaching.
Assessment: Written assignment

Forms of assessment	Time	Percentage	Deadline
ASSIGNMENT		1/1	

PSY3083 Specialization in Biological and Cognitive Aspects of Development

Teaching: Spring: 7.50 Cr
Language of instruction: English
Grade: Letter grade
Compulsory assignments:
Required previous knowledge: Requirements: Bachelor's degree in Psychology or equivalent.
Learning objectives: The course should (1) provide an opportunity for both theoretical and practical knowledge in cognitive and/or biological aspects of human change processes by participation in ongoing research, (2) provide experience in carrying out projects in the selected areas, (3) provide exercise in oral presentation of research
Academic content: The purpose of the course is to develop and integrate theoretical, practical and methodological knowledge in cognitive and/or biological aspects of development. A number of projects will be offered, of which the student should choose two, ensuring that two different methodological approaches will be covered. To maintain a fairly equal distribution of students among the projects, it might not be possible to guarantee that all students will have their first choices. In accord with a teacher students may also propose a project of their own.
Course materials: Syllabus: 400 pp
Teaching methods and activities: Teaching semester: Spring
Semester cycle: Flexible cycle, graduate level
Teaching methods and activities: Tutorials, exercises, project work and oral presentation
Compulsory activities: Oral presentation
Examination: Two paper presentations, written and oral Letter grades on each paper. The papers are weighted 1/2, 1/2 in the final grade (A through F).
Deadlines: Schedules for oral presentation is set up before January 31. Submission of written paper on March 15.
Assessment: Written assignment

Forms of assessment	Time	Percentage	Deadline
ASSIGNMENT		1/2	
ASSIGNMENT		1/2	

PSY3084 Individually Selected Text

Teaching: Autumn: 15.0 Cr
Language of instruction: English
Grade: Letter grade
Compulsory assignments: None
Required previous knowledge: Requirements: Bachelor's degree in Psychology or equivalent.
Learning objectives: Extensive knowledge of an area of particular interest to the student.
Academic content: The student chooses the subject, and a syllabus of approximately 800 pages, for the paper. This is to be approved by the subject teacher and an appointed supervisor. The curriculum cannot include literature used as syllabus in other courses in the program. The student is free to choose an area related to, or not related to the area of the Master's Thesis.
Course materials: Syllabus: Individually selected, 800 p.
Teaching methods and activities: Teaching semester: Autumn
Semester cycle: Flexible cycle, graduate level.
Teaching methods and activities: Self study.
Examination: Individual paper, approximately 15 to 20 pages, submitted at the end of the semester. Letter grade.
Deadlines: In agreement with examiner and administration.
Assessment: Written assignment

Forms of assessment	Time	Percentage	Deadline
ASSIGNMENT		1/1	

PSY3085 Specialization in Relational and Cultural Aspects of Development

Teaching: Spring: 7.50 Cr
Language of instruction: English
Credit reduction: SANT3506 'Specialization in Relational and Cultural Aspects of Development' (7,5 cr)
Grade: Letter grade
Compulsory assignments: None
Recommended previous knowledge: See formal requirements.
Required previous knowledge: Bachelor's degree in Psychology or equivalent.
Learning objectives: The course should
- provide an opportunity for both theoretical and practical knowledge in interpersonal, social, and cultural aspects of human change processes by participation in ongoing research,
- provide experience in carrying out projects in the selected areas
- provide exercise in oral presentation of research results.

Academic content: The purpose of the course is to develop and integrate theoretical, practical and methodological

knowledge in interpersonal, social, and cultural aspects of development. A number of projects will be offered, of which the student should choose two, ensuring that two different methodological approaches will be covered. To maintain a fairly equal distribution of students among the projects, it might not be possible to guarantee that all students will have their first choices. In accord with a teacher, students may also propose a project of their own.
Course materials: Syllabus: 400 pp
Teaching methods and activities: Teaching semester: Spring Semester cycle: Flexible cycle, graduate level Teaching methods and activities: Block teaching: lectures and seminars Examination: Two paper presentations, written and oral. Letter grades on each paper. The papers are weighted 1/2 - 1/2 in the final grade. Deadlines: Submission of papers 2 weeks after end of block teaching.
Assessment: Written assignment

Forms of assessment	Time	Percentage	Deadline
ASSIGNMENT		1/2	
ASSIGNMENT		1/2	

PSY3904 Master's Thesis in Human Development

Teaching: 1st sem. autumn, 2nd sem. spring: 45.0 Cr
Language of instruction: English
Grade: Letter grade
Compulsory assignments: None
Required previous knowledge: Requirements: Bachelor's degree in Psychology or equivalent.
Learning objectives: After having completed the Master's Thesis the student should have acquired ability to (1) carry out a scientific research project, (2) think in a principled and logical way, (3) work independently, (4) carry out a large project within a predefined time frame.
Academic content: The Master's Thesis consists of a theoretical or empirical investigation on a subject chosen within the above described enlarged definition of Human Development, preferably related to one or several of the specializations studied in PSY3083 and PSY3085. The student should contact teachers at the Master's programme for advice on choice of subject.
Supervision is an important part of the work with the Master's Thesis. It will ensure that the student is acquiring relevant knowledge and guarantees high standards in collection and analysis of data. It will also ensure that it follows the guidelines for research ethics. Supervision is therefore compulsory for every student that wishes to submit a Master's Thesis. The subject for the Master's Thesis will have to be approved by the Department of Psychology, which also appoints an academic supervisor. The Department will announce deadlines for applications for approval of subject and appointment of supervisor. The main office of the Department provides application form.
There are specific rules for how a Master's Thesis should be written, as well as criteria for grading a thesis. The Department provides this on request.
Examination in PSY3904 is passed in the last semester of the programme and the student register for the exam on a specific form provided by the Department, in addition to regular exam registration. The Master`s Thesis is submitted in six copies.
Teaching methods and activities: Teaching semesters: Autumn and spring
Teaching methods and activities: Self study
Examination: Master's Thesis and oral exam. Letter grade.
Deadlines: In agreement with examiner and administration
Assessment: Thesis

Forms of assessment	Time	Percentage	Deadline
THESIS		1/1	

CREDIT REDUCTIONS DUE TO OVERLAP IN CONTENT

SANT3506 PSY3085 7, 5 credits
Students admitted to the study programme the fall 2006 follow the study plan for the academic year of 2006 - 2007. They do however have the right to exchange SANT3506 for PSY3085, if they wish.

MASTER OF SCIENCE IN EXERCISE PHYSIOLOGY AND SPORT SCIENCES

The MSc is a research and thesis-based integrated graduate degree programme in Exercise Physiology at the Faculty of Medicine. It is exclusively concerned with basic research training and comprises compulsory courses together with a master thesis. The programme is connected to ongoing research and has a focus on training interventions and its basic mechanisms in sports performance as well as effects in preventive medicine, treatment, rehabilitation and ageing.

The Master of Science degree is a requirement for further research work at PhD level within the Exercise Physiology programme.

This is a 120-credit international programme, and the teaching and tutoring are in English.

Research Themes in the Exercise Physiology Group

There are two main goals for the research group. One is to examine basic mechanisms for central and peripheral limitations connected to supply and demand of oxygen transport, and identify training responses within the different mechanisms. Similarly to examine the basic mechanisms for muscular and neural limitations to strength, power and co-ordination, and identify training responses within the mechanisms. The prescription of effective endurance and strength training and the different effects of these mechanisms on top sport performance is one of the aims for the research programme.

The second aspect of the research programme is based upon the fact that the fastest developing diseases within the population such as obesity, atherosclerosis, diabetes II and osteoporosis are related to inactivity. Effective training interventions based on basic biological adaptations have given positive effects and are effective treatments with a high socio-economic, as well as quality of life outcomes. Other patient groups such as lung disease patients also seem to be able to benefit considerably from new developments in the understanding of limitations to oxygen transport and specific training interventions.

Job Prospects

The MSc is a research training and preparation for a PhD degree. It is a graduate level degree that gives entrance to high school and college level teaching. For students with a clinical health background, the degree is an important background for understanding and interpreting research and change in methods for prevention, treatment and rehabilitation of diseases. It is thus an important background for leading positions within the health community

Target Group

Students with a Bachelor degree in Exercise Science, Sport Sciences, Biology, Medicine or a clinical 3 year health education within Physiotherapy, Nursing, Biochemistry, Occupational therapy or similar fields that wants to pursue a career in research, teaching or professional leadership.

Admission Requirements

Admission requirements to the MSc programme are a bachelor’s degree or an equivalent 3-year university or college education, normally with a major in Exercise Physiology, Sport Sciences, Exercise Science, Biology, or a three year health education in Medicine, Physiotherapy, Nursing, Biochemistry, Occupational therapy or similar fields. A firm foundation in human biology is required within the bachelor’s degree.
10 students will be admitted to the programme every year.

Study Form

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.

Structure and Curriculum

<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>MFEL1010
Introduction to Medicine for Non-MD's
(7.5 credits)</td><td>Experts in Team
(7.5 credits)</td><td rowspan="2">SPO3070
Research Apprenticeship in Exercise Physiology
(15 credits)</td><td rowspan="4">SPO3901
Thesis in Exercise Physiology
(45 credits)</td></tr>
<tr><td>SPO3020
Training Circulation and Oxygen Consumption
(7.5 credits)</td><td>SPO3055
Research Methods in Exercise Physiology
(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><td rowspan="2"></td></tr>
<tr><td>SPO3040
Environmental Adaptations
(7.5 credits)</td></tr>
</table>

Year 1

'Experts in Team – Interdisciplinary project" (EiT) is a 7.5-credit compulsory course for all master students at NTNU. EiT is taught intensively in the weeks 2, 3, and 4 in the second semester. More information about this can be found on the following website: **www.ntnu.no/eit/**.

MFEL1010	**Medicine for Non-Medical Students, Introduction (Medisin for ikke-medisinere)**
Credits:	7,5
Period:	Autumn/Spring
Teaching methods:	Lectures are only given in the autumn. They are held in Norwegian, but all lectures are available in English as films through It's learning. In addition all presentations are available as pdf-files at the same site. 7 compulsory PBL-assessments must be solved and delivered through the internet.
Recommended entry requirements:	No previous knowledge of medicine is necessary.
Entry requirements:	Admission to MSc in Exercise Physiology and Sport Sciences
Compulsory activity:	7 PBL exercises in both terms
Mode of assessment:	3-hour written exam
Course coordinator:	Associate professor Asbjørn Støylen

Learning outcomes: Course objective

The aim of the course is to provide a general introduction to medicine to students who wish to apply their knowledge in projects within medicine. The course is particularly directed towards students within the fields of technology, informatics and administration, but will also serve as a perspective theme.

Academic content

The subject offers a general introduction to medicine. It deals with the anatomy and physiology of the body, from cell to organ. A number of common diseases like heart attack, cancer, stroke and chronic obstructive pulmonary disease, will be subject to more thorough treatment. Attention is drawn to how public healthcare is organized. Through the course students will also gain an insight into how patients are examined and treated when seeing a medical practitioner. The employment of technology is emphasized. Ethical dilemmas which might arise from the application of medical technology will be subject to discussion.

SPO3020 **Training circulation and oxygen consumption**

Credits:	7,5
Period:	Autumn
Teaching methods:	Lectures, laboratory work, PBL
Entry requirements:	Admission to MSc in Exercise Physiology and Sport Sciences
Compulsory activities:	1. Written report 2. Approved practice report
Mode of assessment:	4-hour written exam
Course coordinator:	Professor Jan Helgerud

Learning outcomes

Insight into limitations for oxygen transport and effective training regimes for improved circulation and aerobic endurance performance.

Academic content

Circulatory function, supply and demand limitations of oxygen to working muscle. Limitations and adaptations in patients and athletes. Training methods and their application to various limitations.

SPO3030 **Training muscle and force production**

Credits:	7,5
Period:	Autumn
Teaching methods:	Lectures, laboratory work, PBL
Entry requirements:	Admission to MSc in Exercise Physiology and Sport Sciences
Compulsory activities:	1. Written report 2. Approved practice report
Mode of assessment:	4-hour written exam
Course coordinator:	Professor Jan Hoff

Learning outcomes

Insight into limitations for muscular force and effective training regimes for improved muscular function and its effect on muscular as well as circulatory performance.

Academic content

Muscle architecture and differences in the population. Changes related to age and diseases. Limitations and functional adaptations in patients and athletes. Training methods for neural adaptations and protein synthesis. Neuromuscular basis for motor skill acquisition.

SPO3040 **Environmental adaptations**

Credits:	7,5
Period:	Autumn
Teaching methods:	Lectures, PBL
Entry requirements:	Admission to MSc in Exercise Physiology and Sport Sciences
Compulsory activity:	Written report
Mode of assessment:	4-hour written exam
Course coordinator:	Professor Jan Helgerud

Learning outcomes

Knowing basic physiological impact from environmental stressors such as hyperoxia, hypoxia, high and low temperatures and how to cope with the in an exercise physiology setting.

Academic content

Circulatory and functional responses to a changed environment, such as diving, high altitude / mountaineering, exercise and training in cold and hot environments. Acute and chronic responses and adaptation to training.

SPO3055 **Research methods in Exercise Physiology**

Credits:	7.5
Period:	Spring
Teaching methods:	Lectures, PBL, laboratory work, tutoring
Entry requirements:	Passed MFEL1010, SPO3020, SPO3030 and SPO3040
Compulsory activities:	1. Written report 2. Approved practice report
Mode of assessment:	1-week home exam
Course coordinator:	Professor Jan Helgerud

Learning outcomes

Knowing the basic medical research designs and gaining focus on training intervention studies. Master basic statistical techniques and statistic programs such as SPSS and Excel.

Academic content

Introduction to theories of science, methods in Exercise Physiology research and basic statistics. Normally standard courses given at Faculty of Medicine constitutes the basic part of the course

SPO3060 **Specialisation in Exercise Physiology**

Credits:	15
Period:	Spring
Teaching methods:	Lectures, tutoring
Entry requirements:	Passed SPO3020, SPO3030 and SPO3040
Compulsory activity:	Compulsory litt.: A minimum of 30 articles from peer-reviewed scientific journals.
Mode of assessment:	Report
Course coordinator:	Professor Jan Hoff

Learning outcomes

Intimate knowledge of the research forefront in the area of interest for the Master thesis.

Academic content

Specialisation within the area of research planned for the thesis. Review of research literature, and writing a review article in the area of specialisation for the thesis leading to a logical research question.

Year 2

SPO3070 **Research Apprenticeship in Exercise Physiology**

Credits:	15
Period:	Autumn
Teaching methods:	Lectures, lab demo
Entry requirements	Passed SPO3060
Compulsory activity:	Pilot experiment
Mode of assessment:	Report
Course coordinator:	Professor Jan Hoff

Learning outcomes

Learning to cope with research techniques to be used in the Master of Science experiment and evaluating reliability and validity of the research techniques.

Academic content

This course contents the most usual data collection techniques in the area of Exercise Physiology. The student report consists of a pilot experiment to ensure that data collection techniques or methods planned for the thesis are reliable and valid.

SPO3901	**Thesis in Exercise Physiology**
Credits:	45
Period:	Autumn/Spring
Teaching methods:	Tutoring, laboratory
Required previous knowledge:	Admission to the MSc in Exercise Physiology and Sport sciences. Passed Experts in Team, MFEL1010, SPO3020, SPO3030, SPO3040, SPO3055, SPO3060 and SPO3070
Compulsory activity:	The student has to sign a student contract and hand in a short project description by 15 November in the first semester.
Mode of assessment:	Thesis and oral examination

Learning outcomes:

Carrying out and presenting an experiment that can be developed to the quality of an international peer reviewed paper.

Academic content

The thesis should be within the area of the research competence among the available tutors. The theme has to build upon the specialisation in SPO3060, and the research apprenticeship in SPO3070, and will be subject to approval by the board of professors within the program. The thesis is to be in the format of an article in a peer reviewed research journal with an extended introduction, and will be subject to external evaluation.

MASTER OF SCIENCE IN URBAN ECOLOGICAL PLANNING

Compulsory core courses:

Semester:	Subject no.:	Title:	Autumn	Spring	Note
1.sem	AAR4525	Urban Ecological Planning in Developing Countries. Project work	15 CR		2
1.sem	AAR4816	Urban Ecological Planning. Method	7,5 CR		2
1.sem	AAR4820	Urban Ecological Planning. Theory	7,5 CR		2
2.sem		Electives (see list)		7,5 CR	
2.sem	AAR5300	Urban Ecological Planning in Diverse Cultures		15 CR	
2. sem	AAR5250	Preparation for fieldwork for master's students		7,5 CR	
3.sem	AAR5200	Analysis of Field Work for M.Sc. thesis in Urban Ecological Planning	15 CR		3
3.sem	FP4350	Planning theory and planning process skills	7,5 CR		2
3. sem		Electives (see list)	7,5 CR		
4.sem	AAR5400	Master In Urban Ecological Planning		30 CR	2

AAR5200 Analysis of Field Work for MSc Thesis in Urban Ecological Planning

Lecturer: Hans Christie Bjønness
Weekly hours: Autumn: = 15.0 CR
Time: Will not be taught 2007-2008
Language of Instruction: English
Grade: Passed/Failed Compulsory assignments: Exercises

Recommended previous knowledge: A field work plan shall be presented for and approved by the course responsible and / or the appointed supervisor prior to the field work. The field work is for a two month period during the summer between the second and the third semester. The fieldwork should preferably be in the home country of the participant from a developing country. During the third semester the field work results shall be recorded, analysed and presented.
Evaluation: Evaluation based on pre-fieldwork plan, recording and analysis of field work results and presentation.
Assessment: Assignment

Forms of assessment	Date/Time	Percentage	Exam. support
ASSIGNMENT		1/1	

AAR5250 Preparation for Fieldwork for Master's Students

Lecturer: Professor Hans Christie Bjønness
Weekly hours: Spring: = 7.50 CR
Time: Teaching time and location will be announced on the web.
Language of Instruction: English
Grade: Passed/Failed Compulsory assignments: Exercises

Assessment: Assignment

Forms of assessment	Date/Time	Percentage	Exam. support
ASSIGNMENT		1/1	

AAR5260 GIS in Urban Planning

Lecturer: Førsteamanuensis Alf-Ivar Oterholm
Weekly hours: Spring: = 7.50 SP
Time: Teaching time and location will be announced on the web.
Language of instruction: English
Grade: Letter grade Compulsory assignments: Exercises

Academic content: The course is an introduction to Geographical Information Systems (GIS). Theory, methods, techniques

and applications are illustrated in lectures, seminars, demonstrations and practical exercises. Issues that will be covered are: GIS concept, the raster and vector principles, data capture, data modelling, handling of attribute tabular data, spatial analysis and query, mapping layout etc.
Course material: Heywood, Ian al., 2006: An Introduction to Geographical Information Systems.
Assessment: Oral examination

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION		1/1	

AAR5300 Urban Ecological Planning in Diverse Cultures
Lecturer: Professor Hans Christie Bjønness
Weekly hours: Spring: = 15.0 CR
Time: Teaching time and location will be announced on the web.
Language of instruction: English
Grade: Letter grade Compulsory assignments: None

Assessment: Assignment

Forms of assessment	Date/Time	Percentage	Exam. support
ASSIGNMENT		1/1	

AAR5400 Master of Science Thesis in Urban Ecological Planning
Lecturer: Professor Hans Christie Bjønness
Weekly hours: Spring: = 30.0 CR
Time: Will not be taught 2007-2008
Language of instruction: English
Grade: Letter grade Compulsory assignments: None

Assessment: Thesis

Forms of assessment	Date/Time	Percentage	Exam. support
THESIS		1/1	

Electives:

Subject no.	Title:	Note	Autumn	Spring
AAR8100	Housing Theory and History	1,4	7,5 Sp	
GEOG3050	Theories of Social Change	1,4	15 Sp	
GEOG3561	Gender and Social Change	1,4	7,5 Sp	
GEOG3505	Landscape and Planning	1,4	15 Sp	
GEOG3506	Geography, Health and Development	1,4	7,5 Sp	
AAR4945	Planning and Construction in Developing Countries	2,4		7,5 Sp
AAR5260	GIS in Urban Planning	2		7,5 Sp

1) 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.
2) Spring: Elective courses amounting to 15 Sp shall be selected from the above list.
3) Teaching not 2007/2008
4) Courses summery from page 3

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.

The MSc programme consists of two years corresponding to 120 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.

Year	Semester	7.5 credits	7.5 credits	7.5 credits	7.5 credits
2	**Spring**	Self Study	Master's Thesis	Master's Thesis	Master's Thesis
2	**Autumn**	Optional*	Master's Thesis	Master's Thesis	Master's Thesis
1	**Spring**	Optional*	Optional*	Optional*	Master's Thesis
1	**Autumn**	TFY4220 Solid State Physics	Optional*	Optional*	Master's Thesis

*Optional: See list below for eligible courses. To be discussed with the thesis 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 ECTS 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 every 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 studied.

PLAN OF STUDY

1st year, autumn
Compulsory:
TFY4220 Solid State Physics

Elective:
TFY4292 Quantum Optics
TFY4300 Energy and Environmental Physics
FY3006 Sensors and Transducers
FY3403 Particle Physics
FY3450 Astroparticle Physics
FY3464 Quantum Field Theory I

1st year, spring
Elective:
TFY4190 Instrumentation
TFY4195 Optics
TFY4200 Optics, Advanced Course
TFY4205 Quantum Mechanics
TFY4210 Applied Quantum Mechanics
TFY4235 Computational Physics
TFY4245 Solid State Physics, Advanced Course
TFY4255 Materials Physics
TFY4275 Classical Transport Theory
TFY4280 Signal Processing
TFYxxxx Experts in Team, Interdisciplinary Project
FY3201 Atmospheric Physics
FY3466 Quantum Field Theory II

2nd year, autumn
Elective:
FY3114 Functional Materials
FY8302 Quantum Theory of Solids
Courses listed under 1st year autumn can also be chosen.

2nd year, spring
Self study course to be designed by the academic supervisor.

COURSE DESCRIPTIONS

The following descriptions of courses provide a survey of the topics covered in each course. All courses are 7.5 credits. All courses are given in English.
Weekly hours: F = lecture hours, Ø = exercise hours, S = self study hours
Course responsibility: This indicates the teacher who is responsible for the teaching etc. and who is the contact person for students and others.

TFY4220 Solid State Physics

Weekly hours:
Autumn, 3F+4Ø+5S
Course responsibility:
Professor Steinar Raaen
Recommended previous knowledge:
Some knowledge of physics, mathematics and chemistry.
Academic content:
Atomic structure; Order and disorder, Lattices and unit cells, Crystal directions and planes, Non-crystalline structures, Interatomic bonding, Van der Waals solids, Metallic solids, Ionic solids, Covalent solids, Symmetry, Reciprocal space, Brillouin zones, Structure determination. Lattice vibrations; The continuum approximation, Vibrations of periodic systems, Quantization of vibrational modes: Phonons, Crystal momentum, Heat capacity, Anharmonicity. Static electron systems; Free electron gas, Fermi-Dirac distribution, Electrons in periodic solids, Nearly-free-electron model, Brillouin zones and energy bands, Tight-binding approximation. Dynamic electron systems; Free-electron gas, Periodic solids, Intrinsic semiconductors, Extrinsic semiconductors.
Course materials:
Stephen Elliott: The Physics and Chemistry of Solids, Wiley Chicester, 1998.
Teaching methods and activities:
Lectures, home work problems and mandatory laboratory exercises. The course will be given in English if students on the international master program in physics are attending the course. A re-sit examination may be changed from written to oral.
Learning objectives:
Introduction to solid state physics. This is the first of two courses in introductory solid state physics.

TFY4292 Quantum Optics

Weekly hours:
Autumn, 4F+1Ø+7S
Course responsibility:
Professor Bo-Sture Skagerstam
Recommended previous knowledge:
A basic knowledge of quantum mechanics and classical optics is required.
Academic content:
The course covers topics like the notion of a photon, photon detection processes, coherent and squeezed states of the radiation field, photon correlation experiments, cavity quantum electrodynamics, quantum information theory and quantum cryptography, open systems in quantum mechanics, dissipative systems and master equations for open systems, quantum computers.
Course materials:
Lecture notes.
Teaching methods and activities:
Lectures and obligatory exercises. Evaluation will be based on a final take home exam. The course will be given in English if students on the international master program in physics are attending the course. A re-sit examination may be changed from written to oral.
Learning objectives:
The goal of the course is to provide an insight into theoretical and experimental aspects of modern quantum optics.

TFY4300 Energy and Environmental Physics

Weekly hours:
Autumn, 4F+1Ø+7S
Course responsibility:
Scientist Sverre Vegard Pettersen
Recommended previous knowledge:
General knowledge in physics.
Academic content:
The energy budget of the earth, the green house effect, radiation, atmospheric changes due to human activities. Methods and the physical basis for exploitation of conventional (fossil fuels and nuclear energy) and renewable energy sources (solar radiation, wind, bio mass, ocean waves, tidal and geothermal energy).
Course materials:
Will be given at semester start. Web based information from energy institutions and research institutes. The course uses "It's learning".
Teaching methods and activities:
Lectures and compulsory exercises. The midterm test accounts for 20% of the final grade. The midterm test will only count in a positive direction: If the result of the midterm test is worse than the result in the written examination, the final grade will be written examination only. The course will be given in English if students on the international master program are attending the course. A re-sit examination may be changed from written to oral.
Learning objectives:
The students are going to be able to describe and explain the origins of global effects on the environment caused by human activities, the physical basis for the exploitation of various energy sources, and make assessments on different energy technologies (potential, pros and cons).

FY3006 Sensors and Transducers

Weekly hours:
Autumn, 3F+1Ø+8S
Course responsibility:
Professor Anders Johnsson
Recommended previous knowledge:
University level physics.
Academic content:
The terminology used for characterising the performance of sensors. Discussion of the physical phenomena and devices which can be used for measuring displacement, velocity, acceleration, force, pressure, flow, strain, temperature, radiation and concentration of chemical species. Techniques for improving the signal-to-noise ratio.
Course materials:
Distributed at the start of the semester.
Teaching methods and activities:
The basic principles will be explained through lectures and accompanying reading material. Three or four laboratory exercises, an experimental project, and an assignment involving literature survey form integral parts of the curriculum.
Learning objectives:
To provide an introduction to the workings of sensors and transducers used in modern instruments, placing particular emphasis on commercially available sensors.

FY3403 Particle Physics

Weekly hours:
Autumn, 4F+1Ø+7S
Course responsibility:
Professor Kåre Olaussen
Recommended previous knowledge:
Knowledge of subatomic physics on the level of e.g. FY3402/TFY4285 Subatomic Physics is an advantage. Knowledge of quantum mechanics on the level of e.g TFY4205 Quantum Mechanics is a prerequisite.
Academic content:
The course gives an introduction to central facts and notions of particle physics. Symmetries. Invariances and conservation laws. The quark model. Weak interactions. A short introduction to group theory is given with applications to particle physics, in particular the SU(2) groups for spin and isospin.
Course materials:
D. Griffiths: Introduction to Elementary Particles.
Teaching methods and activities:
Lectures and problem sessions. The final grade is based on a midsemester test (33%) and a final exam (67%).
Learning objectives:
The student is expected to obtain knowledge about important phenomena and concepts of elementary particle physics.

FY3450 Astroparticle Physics

Weekly hours:
Autumn, 3F+1Ø+8S
Course responsibility:
Professor Michael Kachelriess
Recommended previous knowledge:
Relevant knowledge: FY1005 Thermal physics, FY3402 Subatomic physics, TFY4205 Quantum mechanics (or equivalent). Helpful but not necessary is FY2450 Astrophysics.
Academic content:
Main aim of the course "Astroparticle physics" is to understand how astrophysical and cosmological observations can be used to learn about the properties of known and hypothetical particles and, on the way, to understand the universe and its evolution. The course covers three main topics: i) stellar astrophysics, ii) the universe as laboratory for particle physics, and iii) high-energy astrophysics. The course is aimed at physics students in the 4.th year, or anybody else with some knowledge of quantum mechanics/particle physics and statistical physics.
Course materials:
Recommended literature: Donald Perkins: Particle Astrophysics (Oxford University Press 2003). Lecture notes.
Teaching methods and activities:
Oral exam and project. The project counts only if it has a positive effect on the total assessment.
Learning objectives:
The course introduces several basic concepts of stellar astrophysics and astroparticle physics. Students will acquire a working knowledge of methods used in astroparticle physics.

FY3464 Quantum Field Theory I

Weekly hours:
Autumn, 4F+1Ø+7S
Course responsibility:
Professor Kåre Olaussen
Recommended previous knowledge:
Knowledge of quantum mechanics, classical mechanics and/or field theory is an advantage.
Academic content:
Relativistic wave equations: Klein-Gordon, Dirac, Maxwell and Proca equations. Second quantization. Propagators. Elementary quantum electro dynamics. Feynman diagrams and Feynman rules. Calculation of scattering processes.
Course materials:
F. Mandl and G. Shaw, "Quantum Field Theory", John Wiley & Sons.
Teaching methods and activities:
Lectures and problem sessions.
Learning objectives:
The student is expected to obtain knowledge of principals and formalisms of quantum field theories and perturbation theory by the use of Feynman diagrams.

TFY4190 Instrumentation

Weekly hours:
Spring, 2F+8Ø+2S
Course responsibility:
Associate professor Erik Wahlström
Recommended previous knowledge:
The course TFY4185 Measurement Techniques or equivalent.
Academic content:
Computer based measurement techniques: Interfacing, converters, sensors. Connecting measuring devices to computers. Computer lab: graphical programming and virtual instrumentation and programming in LabVIEW. A selection of measurement and control assignments with the use of computers.
Course materials:
To be announced at semester start.
Teaching methods and activities:
Lectures and compulsory calculation exercises. 80 % of the exercises must be approved. Compulsory laboratory exercises and computer assignments.
Learning objectives:
The course shall teach the students principles for and use of computer assisted measurement techniques with control of instruments, measuring devices and data acquisition. The laboratory exercises are going to enable the students to independently utilize this in applications of measurement techniques.

TFY4195 Optics

Weekly hours:
Spring, 3F+4Ø+5S
Course responsibility:
Associate professor Morten Kildemo
Recommended previous knowledge:
TFY4160 or similar.
Academic content:
Wave theory. Basics of polarization and geometrical optics. Matrix model to calculate imaging systems. Radiometry. Basics of coherence and interferometry, Fourier optics and diffraction. Holography and optical signal processing.
Course materials:
Book: Hecht "Optics" - 4th ed. (Addison Wesley; N.-Y. 2002). Lecture notes: to be distributed.
Teaching methods and activities:
Lectures and problem solving. Compulsory lab-work. The course will be given in English if students on the international master program in physics are attending the course. A re-sit examination may be changed from written to oral.
Learning objectives:
The subject gives basic introduction to optics including physical optics with emphasis on imaging, Fourier optics and interferometry.

TFY4200 Optics, Advanced Course

Weekly hours:
Spring, 3F+3Ø+6S
Course responsibility:
Professor Mikael Lindgren
Recommended previous knowledge:
TFY4195 or similar.
Academic content:
Interaction between light and matter. Wave theory treatment of diffraction and Fourier optics. General polarization states, Stokes vectors. Optical waveguides. Birefringence and crystal optics. Non-linear response, frequency conversion and electro-optics.
Course materials:
Book: Hecht "Optics" - 4th ed. (Addison Wesley, N.-Y. 2002). Lecture notes: to be distributed.
Teaching methods and activities:
Lectures, problem solving and compulsory lab-work including a project report. A re-sit examination may be changed from written to oral.
Learning objectives:
The subject introduces the interaction between light and matter in terms of a physical optics treatment.

TFY4205 Quantum Mechanics

Weekly hours:
Spring, 4F+1Ø+7S
Course responsibility:
Professor Arne Brataas
Recommended previous knowledge:

Courses TFY4215 Chemical Physics and Quantum Mechanics and TFY4250 Atomic and Molecular Physics or FY2045 Quantum Physics or similar.

Academic content:

Approximation methods in quantum mechanics. Angular momentum, spin. Identical particles. Time dependent perturbation theory, Fermi golden rule. Scattering theory, Born approximation. Dirac notation. Periodic potentials. Atoms and electrons in magnetic fields.

Course materials:

P.C. Hemmer: Kvantemekanikk, Tapir, 2000. B. H. Bransden and C. J. Joachain: Quantum mechanics, Prentice Hall, 2000.

Teaching methods and activities:

Lectures and calculation exercises. The final grade is based on a midterm exam (20%) and a final written exam (80%). The course will be given in English if students on the international master program in physics are attending the course. A re-sit examination may be changed from written to oral.

Learning objectives:

The course aims to give students advanced knowledge of methods and applications of quantum mechanics.

TFY4210 Applied Quantum Mechanics

Weekly hours:

Spring, 3F+1Ø+8S

Course responsibility:

Professor Asle Sudbø

Recommended previous knowledge:

The courses TFY4250/FY2045 and TFY4205 or equivalent.

Academic content:

The Thomas-Fermi and Hartree-Fock methods for multiple fermion systems with applications on atoms and solids. The Born-Oppenheimer- and WKB-approximations. Semiclassical radiation theory, transition probabilities, dipole approximation, symmetries, photoelectric effect, spontaneous emission. Quantization of the electromagnetic field, photons. Quantized radiation theory, Thomson scattering, selection rules. Addition of angular momentum. The Dirac equation, the angular momentum and magnetic momentum of the electron.

Course materials:

P. C. Hemmer: Kvantemekanikk II, lecture notes.

Teaching methods and activities:

Lectures and home work problems. The course will be given in English if students on the international master program in physics are attending the course. A re-sit examination may be changed from written to oral.

Learning objectives:

The students shall be given an advanced and complimentary fulfilment of the courses TFY4250/FY2045 and TFY4205, with applications in atomic physics, radiation theory and relativistic quantum mechanics.

TFY4235 Computational Physics

Weekly hours:

Spring, 3F+1Ø+8S

Course responsibility:

Professor Alex Hansen

Recommended previous knowledge:

Basic knowledge of physics corresponding to TFY 4230 Statistical Physics. Some experience in programming.

Academic content:

Scalar, vector and parallel computers, linear algebra, finite difference methods, stochastic methods, ordinary differential equations, partial differential equations, optimization, linear programming, genetic algorithms, simulated annealing, Fourier methods, wavelet analysis, Monte Carlo methods, molecular dynamics, quantum mechanics, cellular automata.

Course materials:

Lecture notes in English; Press, Flanery, Teukolsky and Vetterling: Numerical Recipes.

Teaching methods and activities:

The course will be given in English if students on the international master program in physics are attending the course. Evaluation will be based on a final take home exam.

Learning objectives:

The goal of the course is to equip the students with a tool box of numerical methods in use or under development in computational physics.

TFY4245 Solid State Physics, Advanced Course

Weekly hours:
Spring, 3F+1Ø+8S
Course responsibility:
Professor Jon Otto Fossum
Recommended previous knowledge:
TFY4220 Solid State Physics.
Academic content:
Electrodynamics, metals, superconductivity, semiconductors, dielectric and magnetic properties, piezoelectricity, ferroelectricity, dia- and paramagnetism, ferro- and antiferromagnetism, magnetic resonance, reduced dimensionality, structure and scattering, crystals, liquid crystals, disordered materials, defects, phase transitions, critical phenomena, mean field theory, linear response theory, fields and susceptibilities, microscopic dynamics.
Course materials:
Stephen Elliott: The Physics and Chemistry of Solids, Wiley, 1998, parts of the book not covered in TFY4220 Solid State Physics . Gert Strobl: Condensed Matter Physics, Springer Verlag 2004.
Teaching methods and activities:
Lectures and written problems. The course includes a compulsory project needed for admission to the final exam. The course will be given in English if students on the international master program in physics are attending the course. A re-sit examination may be changed from written to oral.
Learning objectives:
The students shall learn about the physical properties of solid state physics related to experiments.

TFY4255 Materials Physics

Weekly hours:
Spring, 3F+4Ø+5S
Course responsibility:
TBA
Recommended previous knowledge:
TFY4220 Solid State Physics or equivalent.
Academic content:
i) Crystallography: Elementary introduction. Point and space groups. International Tables for Crystallography. ii) Diffraction: Kinematic theory for electron, neutron and x-ray diffraction. Ordered materials in polycrystalline and monocrystalline form. Determination of crystal structures. Partially ordered materials. Nano- and microstructures. Small angle scattering. Surfaces. iii) Imaging: Electron microscopy, SEM, TEM. X-ray microscopy, tomography, topography. Scanning surface microscopies, STM, AFM, SNOM. iv) Spectroscopy: XAFS and EELS. Inelastic x-ray and neutron scattering. v) Inhomogeneities: Defects, dislocations; multicomponent materials. Phase diagrams. The methods will be illustrated by examples like cerams, semiconductors, organic structures, and "modulated" materials, "quasicrystals", surface "reconstructions", adsorbates, amorphous materials, low-dimensional structures. Precipitates. Phase transitions.
Course materials:
Emil J. Samuelsen: "Materials Physics; structure, diffraction and imaging" NTNU 2004.
Teaching methods and activities:
Lectures, exercises, laboratory work. Midterm exam and full-time exam. The midterm exam will count 20% and the full-time exam 80% for the marks, which will be converted into letters of evaluation in the final marking of the subject. The course will be given in English if students on the international master program in physics are attending the course. A re-sit examination may be changed from written to oral.
Learning objectives:
Give insight in central methods for revealing the internal structure and dynamics of materials: Diffraction, imaging and spectroscopy.

TFY4275 Classical Transport Theory

Weekly hours:
Spring, 3F+1Ø+8S
Course responsibility:
Associate professor Ingve Simonsen
Recommended previous knowledge:
Basic skills in physics, mathematics and statistics.
Academic content:
The course is concerned with central concepts in classical transport theory and their applications. The following topics are treated: stochastic variables, Markov processes, correlation functions, Wiener-Khinchin theorem, fluctuation-dissipation theorem, Chapman-Kolomogorov-Smoluchowski equations, master equation, Langevin equation and various so-called microscopic equations for describing particle transport. Particular emphasis will be placed on the physical contents and applications of transport theory to chemical reaction kinetics, and scattering of light and photon transport in micro- and nanostructures.
Course materials:
Reading material will be distributed at the start of the semester.
Teaching methods and activities:

Lectures and exercises. The final grade will be based on continuous evaluation, which will comprise of final examination (70%) and mid-term tests (30%). The marks for each activity will be awarded on a percent scale, but the final grade will be given in terms of alphabetical grading. A re-sit examination may be changed from written to oral.
Learning objectives:
The course provides a general introduction to the fundamental concepts and principles of classical transport theory, together with some modern applications.

TFY4280 Signal Processing

Weekly hours:
Spring, 4F+1Ø+7S
Course responsibility:
Professor Anders Johnsson
Recommended previous knowledge:
Basic physics, mathematics and statistics
Academic content:
Description and analysis of stochastic and random signals, and measured signals with noise. Excitation-response analysis of linear systems, correlations and energy spectrum analysis.
Course materials:
P. Denbigh: System analysis and signal processing with emphasis on the use of MATLAB (Addison-Wesley 1998). Lecture notes.
Teaching methods and activities:
Lectures, assignments, computer laboratory exercises. The course will be given in English if students on the international master program in physics are attending the course. A re-sit examination may be changed from written to oral.
Learning objectives:
An introduction to the processing and analysis of experimental measurement signals and time series.

Experts in Team

For more information about Experts in Team and the villages, see www.eit.ntnu.no.

FY3201 Atmospheric Physics

Weekly hours: Spring, 4F+1Ø+7S
Course responsibility:
TBA
Recommended previous knowledge:
Basic physics courses corresponding to one year study in physics at university/college level.
Academic content:
Description: The following topics are discussed: Composition and structure of the atmosphere; thermodynamic processes and stability. Scattering, absorption and transmission of solar and thermal radiation; dependence on aerosols, clouds and other variable components; greenhouse and climate effects. Spectral measurements of atmospheric radiation; polarisation effects; monochromators, detectors and standards; general characterisation of spectroradiometers; measurement errors.
Course materials:
To be announced at the beginning of the semester.
Teaching methods and activities:
Lectures and project. The project is compulsory and count 20% to the final result. The project can be experimental or theoretical, an oral presentation is given at the end to the class.
Learning objectives:
The course will be a first introduction to atmospheric physics, with emphasis on transmission of solar radiation and thermal balance, cloud formation and stratification.

FY3466 Quantum Field Theory II

Weekly hours:
Spring, 4F+1Ø+7S
Course responsibility:
Professor Kåre Olaussen
Recommended previous knowledge:
Knowledge of field theory on the level of e.g. TFY4270 Classical Field Theory, and/or particle physics on the level of FY3403 Particle Physics is an advantage. Knowledge of introductory quantum field theory on the level of FY3464 Quantum Field Theory I is a prerequisite.
Academic content:
The course is a continuation of FY3464 Quantum Field Theory I. Radiative corrections to QED. Renormalization. The Adler-Bell-Jackiw anomaly. Non-abelian gauge theories. Spontaneous symmetry breakdown. The Goldstone theorem. The Higgs mechanism. QCD. Asymptotic freedom.
Course materials:
F. Mandl and G. Shaw, Quantum Field Theory, John Wiley & Sons. M. E. Peskin and D.V. Schoeder, Introduction to Quantum Field Theory, Addison-Wesley
Teaching methods and activities:
Lectures and problem sessions.
Learning objectives:
The student is expected to obtain insight into the most important aspects of the Standard Model of Particle Physics.

FY3114 Functional Materials

Weekly hours:
Autumn, 3F+2Ø+7S
Course responsibility:
Professor Randi Holmestad
Recommended previous knowledge:
FY3112/TFY4220 Solid State Physics
Academic content:
Functional materials are materials that can be exploited either because of their intrinsic properties or added properties after treatment. Subjects: relation between properties and symmetry. Polymers. Electronic bands structures. Semiconductors: transistors; electronic memory. Organic semiconductors. Electric conduction: "free electrons"; electron correlation; metal oxides; semiconductor-to-metal transitions; low-dimensional conductors. Superconduction: classes of SC materials. Dielectrika; ferro- and piezo-electrika; frequency-dependent optical parameters; liquid crystals. Displays; optical memory. Magnetism: soft magnets; permanent magnets; magnetic memory. Magneto-resistance; spin-valve systems.
Course materials:
R.E. Hummel: "Electronic Properties of Materials"; E.J. Samuelsen: "Structure and Properties of Materials".
Teaching methods and activities:
Lectures and student work, project work and presentations.
Learning objectives:
To give the student a wide basis of knowledge in important materials for today and for the future. Skills in writing reports.

FY8302 Quantum Theory of Solids

Course responsibility:
Professor Asle Sudbø
Recommended previous knowledge:
TFY4205 Quantum mechanics, TFY4210 Applied quantum mechanics, TFY4230 Statistical physics.
Academic content:
Weekly hours:
Autumn, 3F+2Ø+7S
The course is given every other year, or upon agreement with the lecturer, next time autumn 2008. The course gives a description of elementary excitations in solids. Contents: Second quantization, electron-phonon interaction, BCS-theory and superconductivity, electron correlations, metal-insulator transition. The Kondo problem, Kosterlitz-Thouless transitions, Fermi liquids, singular Fermi liquids.
Course materials:
Quantum theory of solids, compendium.
Teaching methods and activities:
Lectures, colloquia, or guided self study, depending on the number of students.
Learning objectives:
The student is expected to obtain insight into modern quantum theory of solids, and further, through chosen examples, obtain a deeper understanding of key concepts within condensed matter physics, such as phase transitions and correlations.

MASTER OF SCIENCE IN NATURAL RESOURCES MANAGEMENT

Introduction
Natural resources such as water, fossil energy (oil, gas), minerals and the biological resources in land and water ecosystems are the basis for our survival and development both on national and global scales. Sustainable use of natural resources demands an interdisciplinary approach encompassing sound in-depth knowledge about each specific resource and as well as a holistic perspective.

Management for sustainable use of natural resources requires knowledge and awareness of prerequisites, an understanding of the connections and the ability to communicate between different disciplines and actors.

The increasing needs and demands for natural resources along with the continuous decrease of finite resources impose stronger demands on sustainable management regimes. This involves ecological, economic and social perspectives and an interdisciplinary knowledge base. Competence in communication across disciplines is a compulsory skill. The global aspect of the use of natural resources calls for greater insight, knowledge and sustainable management.

Examples of issues to be addressed in the programme for Management of Natural Resources Management (NRM):

How can our natural resources be managed in a way so they will remain accessible for future generations? How can the increasing energy demand on our planet be met in a sustainable and fair way? What kind of technology is needed kind of institutions? How can everyone get access to clean water? How can the water resources in the world be used sustainably? What type of institutions and regulations are needed to omit overfishing and overutilization of land based biological food and grazing resources?

The MSc programme in Natural Resources Management is unique due to its combination of disciplines from fields of technology, the natural sciences and social sciences. The MSc programme in NRM takes 2 years of full-time study.

The language of teaching is English.

Formal prerequisites
In order to be admitted to the programme a bachelor's degree is required in Biology, Chemistry, Geography, Geology, Biomathematics or similar, Economics, Sociology and Political Science or Engineering. The bachelor's degree must include subjects in resource management, planning and interdisciplinary project management equivalent to one term of full-time study. The students will belong to the departments of Biology, Chemistry, Geography, Geology, Mathematical Sciences, Economics, Sociology and Political Science, according to their specialization.

English language requirements: TOEFL score 500/170, IELTS mark: 5.0

Learning objectives
This programme will give a unique education and the knowledge required to solve a number of interdisciplinary challenges related to the management of natural resources.

Career prospects
This education is suited for positions in public sector authorities and organizations on all levels from regional to global. A result of the development of national and international laws and regulations on the use of sustainable resources is that the demand for professionals with this specialist education is growing in all kinds of enterprises.

<table>
<tr><td>Year</td><td>Semes-ter</td><td></td><td></td><td colspan="3"></td></tr>
<tr><td rowspan="2">2</td><td>Spring</td><td rowspan="4">“R FEL 3080” Scientific Seminars in Natural Resource Management (7,5 credits)</td><td rowspan="4">Elective Courses (22,5 credits)</td><td>Special Syllabus for Master’s Degree</td><td colspan="2">Master’s Thesis 60 credits</td></tr>
<tr><td>Autumn</td><td colspan="3"></td></tr>
<tr><td>1</td><td>Spring</td><td>Experts in Team, Interdisciplinary Project</td><td colspan="2"></td></tr>
<tr><td>Autumn</td><td>“RFEL3081” Natural Resourses Management, Interdisciplinary Project</td><td>GEOG3030 Natural Resourses Management</td><td></td></tr>
<tr><td colspan="2">Emnestørrelse:</td><td colspan="2">7,5 credits</td><td>7,5 credits</td><td>7,5 credits</td><td>7,5 credits</td></tr>
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Elective Courses in Chemistry:
KJ 3055 Analytical Atomic Spectrometry (7,5 credits) Spring
KJ 3071 Applied geochemistry (7,5 credits) Autumn
KJ 8056 Chemical Sensors and Biosensors (7,5 credits) Autumn
KJ 8052 Analytical Electrochemistry and its Application within Industrial and Environmental Monitoring (7,5 credits) Autumn
KJ 8070 Advanced Aquatic Chemistry (15 credits) Autumn

Elective Courses in Biology:
BI3004 Behaviour and Conservation Biology (7,5 credits) Autumn
BI3032 Population dynamics (7,5 credits) Spring
BI3072 Environmental Toxicology (7,5 credits) Autumn
BI3080 Biodiversity (7,5 credits) Spring

Elective Courses in Geology:
Several courses given at the Department of Geology and Mineral Resources Engineering can be relevant for a Master programme in Natural Resources Management, depending on the specific interests of each student. Students that wish to strengthen their geoscientific profile can contact the responsible lecturer(s) at the department in order to get information about the prerequisites for each master level or Ph.D course.

Elective Courses in Sociology and Political Science:
POL2008 Political Economy (15 credits) Spring *
POL3503 International Political Economy (15 credits) Autumn and spring *
SOS3508 Resource Management: Institutions and Institutional Design

***** If the number of students are less than 5, there will be no lectures.

Elective Courses in Geography:
GEOG3505 Landssape and Planning (15 credits) Autumn
GEOG3052 Research Methodology (15 credits) Spring
GEOG3515 Environment, Development and Changing Rural Livelihoods (7,5 credits) Autumn

Elective Courses in Statistics:
TMA4300 Modern Statistical Methods (7.5 credits) Spring
TMA4270 Multivariate Analysis (7.5 credits) Autumn
TMA4295 Statistical Inference (7,5 credits) Spring

Other Elective Courses:
AAR4845 Landscape Planning and GIS, (7,5 credits) Autumn
SØK3524 Environmental and Resource Economics (15 credits) Autumn and spring

It is possible to choose other courses according to spesific interest and in agreement with the supervisor and responsible department.

Course descriptions

Department of Biology

RFEL3080 Scientific Research Seminar in Natural Resource Management

Lecturer:	Professor Gunilla Rosenqvist	
Weekly hours:	Autumn: Spring: = 7.5 Cr	
Time:	Teaching time and location will be announced on the web.	
Grade:	Pass/Fail	Compulsory assignments: Participation of min. 75% of all seminars and 2 presentations

Learning objectives: The main goal of this course is to give the students an overview and acquaintance of current issues within the field of management of natural resources. This includes both management challenges and related research tasks. The course spans over the wide field of natural resources including biological, geological and energy resources with the socio-economic aspect intertwined in each of them.
Additonally, the course should train the students in project presentation, formulation of project goals, hypotheses and scientific argumentation.
Required previous knowledge: Admitted participant in Master of Science in Natural Resources Management
Academic content: Scientific seminars and guest lectures based on subjects of Management of Natural Resources. Among the seminars some will be literature seminars based on scientific papers while the majority of seminars will be given as project presentations by the master students. For approval the student will have to give two presentations during the master study, the first one early in the study to discuss the scientific plan, the other one late in the study to discuss the results of the student's project. Attendance in this course is compulsory for the students.
Guest lectures will be given by senior researchers, mainly international guests. All teachers and studentadvisors involved in the program is to attain the seminars.
Teaching methods and activities: Seminars
Course materials: To be announced
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support

RFEL3081 Natural Resources Management, Interdisciplinary Project

Lecturer:	Førsteamanuensis Christophe Pelabon	
Weekly hours:	Autumn: = 7.5 Cr	
Time:	Teaching time and location will be announced on the web.	
Grade:	Pass/Fail	Compulsory assignments: Participation of the project

Learning objectives: The major goal of this course is to place the students in a working situation where he will have to approach a problem related to the management of natural resources together with students having different qualification. The specificity of this course resides in the collaborative work and the handling of concrete problems over the wide field of natural resources including biological, geological, geographical and energy resources with the socio-economic aspect intertwined in each of them.
Required previous knowledge: Admitted participant in Master of Science in natural Resources Management.
Academic content: The students of the masterprogram Natural Resources Management are working together in groups with different background. The aspects of the project are to be relevant to management of natural resources, first of all as a concrete case.
An alternative for the Interdisciplinary project could be a review of scientific articles concerning study of litterature dealing with aspects related to issues the student is studying at the master thesis.
Teaching methods and activities: Approval of the project work and oral presentation of the project.
Course materials: To be announced.
Assessment: Assignment

Forms of assessment	Date/Time	Percentage	Exam. support
ASSIGNMENT		100/100	

Faculty of Architecture and Fine Art

AAR4845 Landscape planning and GIS

Lecturer: Førsteamanuensis Alf-Ivar Oterholm
Weekly hours: Autumn: 3F+3Ø+3S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: Introduction to and training in ecologically based landscape planning in a broad scale, with weight on analysis methods. Introduction to vector and raster based geographical information systems (GIS) as tool in analysis and planning.
Academic content: Suitability analysis based on ecological and resource possibilities and limitations in landscape and nature. Landscape planning problems in different situations. Cultural landscape, landscape components and landscape ecology. Perception of landscape and visual landscape analysis. Digital data, analysis techniques, model types. Use of GIS in landscape analysis.
Teaching methods and activities: Lectures, seminars, group work and computer exercises. Cooperation with students from diverse faculties.
Course materials: Compendium
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN	To be announced on the web	1/1	

BI3004 Behaviour and Conservation Biology

Lecturer: Professor Gunilla Rosenqvist, Professor Jonathan Wright
Coordinator: Professor Gunilla Rosenqvist
Weekly hours: Autumn: = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments:

Learning objectives: On completion of the course the students should be familiar with principal biological evolutionary questions.
Recommended previous knowledge: BI 1003, BI 2033, BI 2034, ZO 2041, ZO 2042
Academic content: The course runs every second year (2007, 2009).
The aim of the course is to present, discuss and analyse critically principal biological evolutionary questions. Subjects covered include: the making of evolutionary theories, heritability and development, historical evolution, evolutionary mechanisms and co-evolution.
Teaching methods and activities: Lectures/seminars: 30 hours, mandatory
Assessment: Oral examination

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	1/1	

BI3032 Population dynamics

Lecturer: Førsteamanuensis Bård Pedersen, Professor Bernt-Erik Sæther
Coordinator: Professor Bernt-Erik Sæther

Weekly hours: Spring: 2F+1Ø = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments:

Learning objectives: On completion of the course the students should be familiar with basic theoretical features of population ecology.
Academic content: The course provides an introduction to the basic theoretical features of population ecology, with particular emphasis on one-species populations and interactions between species. Subjects covered include demography, population regulation and life history strategies in different animal and plant species. Furthermore, the course focuses on how variation in demographic variables such as reproduction, mortality and dispersal are effected by changes in population size or the environment. In the seminars active participation is required from the students.
Teaching methods and activities: Lectures: 30 hours
Seminar: 10 hours, mandatory
Assessment: Oral examination

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	1/1	

BI3072 Environmental Toxicology

Lecturer: Førsteamanuensis Åse Krøkje
Weekly hours: Autumn: 4F+1S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments:

Learning objectives: On completion of the course the students should be familiar with toxicokinetics, dynamics and also the toxicology of classes of chemical pollutants. Students should be able to show understanding of problems related to complex mixtures.
Required previous knowledge: MNK BI 2071 and/or MNK KJ 2070
Academic content: The course focus is on toxicokinetics, dynamics, and the toxicology of classes of chemical pollutants. Particular emphasis is put on mechanisms and risk assessment. Problems related to complex mixtures of pollutants in air, soil and water will be discussed.
Teaching methods and activities: Lectures: 36 hours
Seminar: 8 hours, mandatory
Assessment: Oral examination

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	1/1	

BI3080 Biodiversity

Lecturer: Førsteamanuensis Christophe Pelabon, Forsker Bård Gunnar Stokke
Coordinator: Forsker Bård Gunnar Stokke
Weekly hours: Spring: 2F+2Ø = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments:

Learning objectives: On completion of the course the students should be familiar with protection of biological diversity from society, biological, and ethical aspects.
Academic content: The course will be concerned with protection of biological diversity from society, biological, and ethical aspects. The Convention on Biological Diversity is used as a starting point. Lectures and seminars will consider causes for extinction of species, principles for protection of threatened species, strategies for sustainable use of ecosystems, juridical- and economical frameworks and tools for sustainable management, and socio-cultural- and ethical aspects. An important part of the course is to write a semester thesis. The aim of the thesis is to get experience in analysing complex cases working in an interdisciplinary group.
Teaching methods and activities: Lectures: 15 hours
Seminar: 30 hours, mandatory
Assessment: Assignment/Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
TERM PAPER		30/100	
WRITTEN	To be announced on the web	70/100	

Department of Geography

GEOG3030 Natural Resourses Management

Lecturer: Førsteamanuensis Jørund Aasetre
Weekly hours: Autumn: 18F = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Field course- 3 days, approved field course report

Learning objectives: The course aims to give students insight into questions of nature management through relating theory to practical management. Current management questions will be highlighted through lectures and fieldwork.
Required previous knowledge: Bachelor in geography. Other relevant qualifications can be accepted upon approval by the Department of Geography
Academic content: The subject focuses on the challenges facing the management of natural resources, including matters such as dealing with different types of conflict, which require a combination of broad professional and practical insight. The course therefore addresses how different practical and professional perspectives can be combined to give increased insight in selected management challenges. The course will take as its starting point a number of management themes which will be illustrated using current theories together with examples of practical solutions. The subject is interdisciplinary and the lectures are held by researchers as well as management representatives.
Teaching methods and activities: 18 hours lectures and an obligatory 3-day field course. The field course report must be approved before a student can take the exam.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN	To be announced on the web	1/1	

GEOG3052 Research Methodology

Lecturer: Førsteamanuensis Stig Halvard Jørgensen
Weekly hours: Spring: 14F+12S = 15.0 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Field trip 7-10 days (incl. preparations, compulsory). Term paper

Learning objectives: The aim of the course is twofold. One main goal is to prepare the student for using methodology in his/her master thesis. The other main goal is to give the students skills and experiences in a fieldwork situation through a common field course.
Academic content: The course is comprised of four parts: (1) a common part, (2) an elective part in which students choose a qualitative or quantitative module, (3) a field course, and (4) an assignment. In the common part, emphasis is placed on developing a critical and reflexive attitude to the choice and usage of different research designs. The common part gives an overview of the possibilities and limitations of different types of data and methods for collecting and analysing data.
In the common part, all students must take part in group work based on designing and using a questionnaire, and will present their work in a seminar.
Students then choose either the qualitative or the quantitative module. Lectures, seminars and practicals will to a large extent be shared with Master of Geography students.
In the qualitative module, students will be trained in using qualitative methods such as different types of interview, observation and text analysis. The tuition comprises lectures, seminars and assignments. The assignments will provide practical training in different techniques for collecting qualitative data and analysis, reflection on ethical approaches to problems, and the communication of such data.
The quantitative module gives a closer presentation of quantitative research schemes, with a particular focus on statistical analysis of available data. Also included is the use of a statistical software package (SPSS) for analysis of data. Research design based on covariance and regression will be presented, as will other analytical techniques based on the students' particular needs. Students must carry out exercises in quantitative techniques which are relevant for their master thesis.
The methodology in both modules is further connected to a field course, in which students work in groups on particular topics. The purpose of the field course is to put into practice the use of methodology, and the group work will form part of a common field course report.
In the concluding part of the course, students will prepare an assignment in which they reflect on use of methodology (based on qualitative and/or qualitative methods), central geographical concepts and development theory in their own master's thesis.
Teaching methods and activities: Lectures: 14 hours
Seminars:12 hours
Field course:7-10 days (incl. preparations)
Requirement: Approved field course with report and assignments/exercises
Exam: Oral exam
Course materials: Will be given when the semester starts.
Assessment: Oral examination

Forms of assessment	Date/Time	Percentage	Exam. support

ORAL EXAMINATION	To be announced on the web	1/1	

GEOG3505 Landscape and Planning

Lecturer: Professor Michael R.Handley Jones
Weekly hours: Autumn: 30F = 15.0 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Approved term paper/project work.

Learning objectives: The course aims to give insight into theoretical and methodological problems in connection with landscape seen in relation to planning.
Required previous knowledge: Bachelor in geography. Other relevant qualifications can be accepted upon approval by the Department of Geography
Recommended previous knowledge: See formal requirements.
Academic content: The course studies the concept of landscape, landscape values, and theoretical and methodological problems in landscape planning and management. It is offered to students on the Department's two MA degree programs. Students taking the MA in Social Change write an individual semester essay based on the course literature. Students taking the MA in Geography participate in a project where, through fieldwork, interviews and document analysis, they analyse a concrete planning situation in which landscape and environmental values are involved. The project is normally undertaken as group work. The aim of the project is to give insight into how and to what extent consideration of the landscape and environment is included in planning and management and to illustrate what problems relating to landscape and environment are encountered in the general planning process. The lectures will normally be given in English. For students taking the Norwegian master's course, the project is conducted in Norwegian, and the group report will normally be written in Norwegian.
Teaching methods and activities: Teaching method and activities: 30 hours lectures.
Compulsory activity: Approved term paper/project work.
Form of assessment: Oral exam.
Assessment: Oral examination

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	1/1	

GEOG3515 Environment, Development and Changing Rural Livelihoods

Lecturer: Førsteamanuensis Haakon Lein
Weekly hours: Autumn: 14F = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Groupwork and presentation

Learning objectives: The aim of the course is to give student an understanding of the links between development, environment and environmental change and (rural) livelihood in African and Asian societies.
Required previous knowledge: Bachelor in Geography or other social science. Other relevant qualifications can be accepted upon approval by the Department of Geography.
Academic content: Among the topics covered by the course: *History of geographical thought: From environmental determinism to political ecology. *Social nature; Social constructivism and environmental narratives. *Institutions, norms and collective action and the idea of the "community" as basis for natural resource management. *Hazards and vulnerability. Vulnerability; a useful concept or just another way of labelling?: Vulnerability analysis in practice*Environmental conservation and development; from "Fortress conservation" to "Conservation and development"? *Changing rural livelihoods and livelihood analysis; from farm to non-farm and implications for the rural environments. * Environment and conflicts. The "Environment" as basis for conflicts.
Teaching methods and activities: Lectures: 14 hours. Groupwork and presentations (obligatory)
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN	To be announced on the web	1/1	

Department of Chemistry

KJ3055 ANALYT ATOMSPEKTR
Analytical Atomic Spectrometry

Lecturer: Førsteamanuensis Florinel Gabriel Banica
Weekly hours: Spring: 2F = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: An in-depth overview of spectrometric methods for trace elements determination.
Required previous knowledge: KJ2051 or an equivalent class in Instrumental Analysis

Academic content: This course focuses on the most important analytical methods for the determination of chemical elements: Atomic Absorption Spectrometry, Emission Spectrometry and Mass Spectrometry (with emphasis on plasma excitation methods), X-Ray Fluorescence and Radiochemical Methods. These methods are widely used in various fields of activity such as environment monitoring, chemical industry, metallurgy, geology, material technology, food analysis, and Forensic Science.
Teaching methods and activities: Lectures and discussions on analytical methods described in recent publications. Lectures are given in English.
Course materials: 1. Compendium.
2. Lajunen, L.H.J.: Spectrochemical Analysis by Atomic Absorption and Emission, Royal Society of Chemistry, 1992.
3. Vandecasteele, C. Block, C. B.: Modern Methods for Trace Element Determination, Wiley, Chichester, 1993.
Assessment: Oral examination

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	100/100	

KJ3071 ANVENDT GEOKJEMI
Applied Geochemistry

Lecturer: Professor II Rolf Tore Ottesen
Weekly hours: Autumn: 2F+1Ø+9S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Participation in teamwork

Learning objectives: The main theme of the course is geochemical mapping.
Recommended previous knowledge: This course is intended primarily for master and doctorate students and builds on knowledge within environmental chemistry corresponding to KJ2070 Environmental Chemistry. Examples of other courses useful as a background are advanced courses in geology and environmental studies.
Academic content: The course begins with a consideration of methodology dealing with, among other things, sampling of soil and other enviromental matrices, sample density, sample treatment, chemical analysis, statistical treatment and production of maps. During the course a practical environmental investigation will be conducted. Planning, field work, and electrical analysis ends opp in a report.
Teaching methods and activities: Lectures (2 hours per week). Exercise/colloquia: Minimum of one per student, Excursion. Term paper. English teaching by request.
Course materials: Will be annonced at beginning of the semester, or the students may contact lecturer by e-mail: rolf.ottesen@ngu.no
Assessment: Report

Forms of assessment	Date/Time	Percentage	Exam. support
REPORT		100/100	

KJ8052 Analytical Electrochemistry and its Application within Industrial and Environmental Monitoring

Lecturer: Professor Øyvind Mikkelsen
Weekly hours: Autumn: 2F+4Ø+6S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: This is a advanced course of electroanalytical methods with relevance for industrial and environmental monitoring. The course focus on practical as well as theoretical aspects, including electrode reactions, surface chemistry, and constructions of of sensors based on nanotechnology.
Recommended previous knowledge: The course is based on KJ2050, KJ2051.
Academic content: This is a advanced course of electroanalytical methods, with practical as well as theoretical aspects. Electrode reactions and surface chemistry are important parts of the course. Different methods like conductometry, potentiometry and different voltammetric techniques will be discussed, including stripping voltammetry, and also potentiometric stripping analysis. Trace level methods, and methods to investigate different chemical forms (speciation) will be discussed. In this course, methods of relevance for industry and environmental monitoring will be emphasized. Further, constructions of sensors based on nanotechnology are focused.
Teaching methods and activities: Lectures (20 hours), laboratory work (40 hours) and project work. The course is given concentrated in two weeks, two hours with lectures every day. The laboratory course are devided in to parts, one part for each week. As a part of the laboratory course, it is a project work to be carried out during and between the teaching periods. Between the two teaching periods, each with duration of one week, it is self study with supervision. Portfolio assessment: Midterm examination (25%), course report (10%) and final examination (65%). English teaching by request.
Course materials: Joseph Wang: Analytical Electrochemistry 2. ed. Wiley-VCH 2000
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	65/100	
REPORT		10/100	

	MIDTERM EXAMINATION	25/100

KJ8056 Chemical and Sensors and Biosensors

Lecturer: Førsteamanuensis Florinel Gabriel Banica
Weekly hours: Autumn: 2F+10S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: An in-depth study of the priciples and applications of chemical and biochemical sensors.
Required previous knowledge: KJ2051 or equivalent class in Instrumental Analysis.
Academic content: A chemical sensor is capable to recognize a chemical component of a sample and perform the real-time transduction of the concentration value into a physical signal (electrical, optical, or of another kind). This course gives an overview of the underlying principles for the main classes of chemical sensors, (electrochemical, optical, piezoelectric, enzyme, affinity and microbiological sensors). Applications in various fields, as, for example, industry, environment monitoring, biotechnology and medicine are discussed. Particular attention is paid to the thermodynamic and kinetic principles as well as to the applications of Supramolecular Chemistry for chemical recognition purposes. Application of Microelectronics and advanced materials in chemical sensor design are frequently referred to.
Teaching methods and activities: Lectures (2 hours / week) in English.
Course materials: 1. Compendium.
2. Diamond, D.: Principles of chemical and biological sensors, J. Wiley, New York, 1998.
Assessment: Oral examination

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	100/100	

KJ8070 Advanced Aquatic Chemistry

Lecturer: Førsteamanuensis Trond Peder Flaten
Weekly hours: Autumn: 3F+21S = 15.0 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The course aims to provide the students with an in-depth theoretical understanding of the chemical processes that govern the chemical composition of natural waters.
Recommended previous knowledge: The course builds on knowledge corresponding to parts of KJ2070.
The course is primarily aimed at students in environmental chemistry and geochemistry working on problems related to water, soil and sediments, but also other students e.g. in limnology, may find the course useful.
Academic content: The course provides a comprehensive treatment of homogeneous and heterogeneous chemical equilibria in natural aquatic systems (acid/base reactions, precipitation/dissolution reactions, complex formation, redox reactions, weathering, solid-solution interface reactions and atmosphere-water interactions).
Teaching methods and activities: Three hours of lectures per day for three weeks (intensive teaching). The language is normally Norwegian, but the course may also be given in English.
Course materials: W. Stumm J.J. Morgan: Aquatic Chemistry, 3. edition. New York: John Wiley, 1996.
Assessment: Oral examination

Forms of assessment	Date/Time	Percentage	Exam. support
ORAL EXAMINATION	To be announced on the web	100/100	

Department of Sociology and Political Science

POL2008 Political Economy: Project Work

Lecturer: Professor Jonathan Moses
Weekly hours: Spring: 2F = 15.0 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: All the activities that are organised in the course are compulsory

Learning objectives: The learning objective is to improve the students' understanding of how theory and empirical observations interact in political science research within the field of political economy.
Required previous knowledge: None.
Recommended previous knowledge: Knowledge of the main theories and concepts in political science.
Academic content: The students will write a individual research paper of up to 25 pages (9000-9500 words) in which they analyse a political economy research question.
Teaching methods and activities: 2 hours of lectures/seminars per week throughout the semester and term paper supervision. The deadline for the research paper is 9 May.

Form of assessment:Research paper and oral examination. The oral exam covers the research paper as well as readings. The oral exam will be used to adjust the research paper's grade by a maximum of one grade.
Course materials: To be decided at the start of the course.
Assessment: Assignment

Forms of assessment	Date/Time	Percentage	Exam. support
ASSIGNMENT		1/1	

POL3503 International Political Economy

Lecturer: Professor Indra Sirimevan de Soysa
Weekly hours: Autumn: 4FSpring: 4F = 15.0 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Presentation

Learning objectives: To introduce the students to the field of international political economy.
Required previous knowledge: POL1000 or POL1001 or at least 60 credits in Economics.
Recommended previous knowledge: See formal requirements.
Academic content: The course offers an introduction to the field of international political economy, i.e. the interaction between markets and states at the international level. The students will be introduced to various theoretical models as well as previous empirical studies. For Master students in sociology formal requirements are waived for courses approved as non-mandatory special courses in sociology.
Teaching methods and activities: Lectures/group discussions, 4 hours per week throughout the semester. Supervision of term paper.
Form of assessment: Term paper and oral examination. The oral exam covers the term paper as well as readings. The oral exam will be used to adjust the term paper's grade by a maximum of one grade. The language of instruction is English. The course is offered when teaching resources are available.
Course materials: To be decided at the start of the course.
Assessment: Assignment

Forms of assessment	Date/Time	Percentage	Exam. support
ASSIGNMENT		1/1	

SOS3508 Resource Management: Institutions and Institutional Design

Lecturer: Professor Erling Berge
Weekly hours: Autumn: 4F = 15.0 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Presentation

Learning objectives: To provide the students with an overview over social science theory on the topic of economic institutions and social development with a particular emphasis on resource management. Through their term paper the students will illustrate their insight into particular theories through the discussion of a particular resource management problem.
Required previous knowledge: Specialization within social sciences.
Recommended previous knowledge: See formal requirements.
Academic content: With the knowledge of resources as a starting point, the purpose of this course is to give an introduction to relevant theories of resource management. This will include theories of public and private goods, theories of collective action, new institutional theory, and theories of legislation and institutional design. In light of these theories we discuss the management of natural as well as constructed resources. We discuss such topics as access, resource development, social constructions, public values and institutional design. There will be approximately 1000 pages of required readings, but about 40% of these pages can be individually selected if the latter is approved by the professor. The term paper will be an independent analysis of a particular topic covered by the lectures, and should be 15-20 pages long (5600-7500 words).
Teaching methods and activities: Lectures and group work 4 hours pr week throughout the semester.
Form of assessment: Individual term paper and oral examination. The oral exam may be used to adjust the grade by one unit on the scale. The oral exam will include the research paper, the individually selected readings and the required readings. The course is offered if available teaching resources.
Course materials: To be decided at the start of the course
Assessment: Assignment

Forms of assessment	Date/Time	Percentage	Exam. support
ASSIGNMENT		1/1	

Department of Economics

SØK3524 Environmental and Resource Economics

Lecturer: Professor Anders Skonhoft
Weekly hours: Autumn: = 15.0 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: One approved term paper.

Learning objectives: Students should obtain in depth knowledge about environmental issues, and knowledge of models important for management of renewable (for example fish) and non-renewable natural resources (for example oil).
Required previous knowledge: None.
Recommended previous knowledge: Compulsory courses in Master?s degree in Economics.
Academic content: The first part of the course includes the theory of external effects, institutions and environmental issues. Theories of environmental regulations and models of climate change and other international environmental issues are discussed. In the part on natural resources, models for optimal management of fish, wood and wildlife will be analysed, in addition to models for non-renewable resources as oil. These problems are mainly dynamic, and the main principles of optimal control theory and dynamic programming will be presented.
Teaching methods and activities: 4 hours of lectures every week. One compulsory term paper. The course can be taught in English if requested.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN	To be announced on the web	1/1	C

Department of Mathematical Sciences

TMA4270 Multivariate Analysis

Lecturer: Førsteamanuensis Mette Langaas
Weekly hours: Autumn: 4F+1Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: The course gives a theoretical introduction to statistical methods for multivariate data (i.e. several variables are measured for each observational unit, and we are interested in using all the variables and their correlation). The students shall be capable of conducting simple statistical analyses of multivariate data using the programming package R.
Recommended previous knowledge: Subject TMA4240/TMA4245 Statistics or equivalent. The subject require a mature understanding of statistics and we recommend also the subjects TMA4260 Industrical Statistics or TMA4255 Design of Experiments and Applied Statistics. A good background in matrix methods is also a requirement (for example the course TMA4145 Linear Methods).
Academic content: Multivariate normal distribution, estimation and hypothesis testing for the multivariate normal distribution, multivariate linear regression, prinsipal components, factor analysis, disciminant analysis, classification and cluster analysis.
Teaching methods and activities: Ledtures, exercises, project/term paper. The exercises demand the use of a computer (computing programme R). The lectures may be given in English. Portfolio assessment is the basis for the grade awarded in the course. This portfolio comprises a written final examination 80% and the semester assignment 20%. The results for the constituent parts are to be given in %-points, while the grade for the whole portfolio (course grade) is given by the letter grading system. Retake of examination may be given as an oral examination.
Course materials: Johnsen Wichern: Applied Multivariate Statistical Analysis, Prentice Hall.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN	To be announced on the web	80/100	C
EXCERCISES		20/100	

TMA4295 Statistical Inference

Lecturer: Professor Nikolai Ushakov
Weekly hours: Spring: 4F+1Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: None

Learning objectives: The course will give a theoretical introduction to general methods for statistical inference.
Recommended previous knowledge: The course is based on TMA4240/4245 Statistics or equivalent. The course demands some degree of maturity in Statistics, and TMA4260 Industrial Statistics or TMA4255 Design of Experiments and Applied Statistical Methods are recommended to have in advance.

Academic content: General principles for statistical analysis. Bayesian,
maximum-likelihood, method of moment and least-squares methods for estimation. Optimal estimators. General theory for confidence intervals and testing of hypothesis. Optimal tests. Asymptotic properties of estimators and tests.
Teaching methods and activities: Lectures and exercises. The lectures may be given in English. Written final examination is the basis for the grade awarded in the course. Retake of examination may be given as an oral examination.
Course materials: George Casella, Roger L. Berger: Statistical inference, 2nd Edition, Duxbury, 2002.
Assessment: Written examination

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN	To be announced on the web	100/100	A

TMA4300 Modern Statistical Methods

Lecturer: Førsteamanuensis Håkon Tjelmeland
Weekly hours: Spring: 3F+2Ø+7S = 7.5 Cr
Time: Teaching time and location will be announced on the web.
Grade: Letter grade Compulsory assignments: Exercises

Learning objectives: This subject gives an introduction to modern computer based techniques for statistical inference. The students will through the mandatory exercises be capable of applying the theory in simple situations.
Recommended previous knowledge: Subject TMA4240/TMA4245 Statistics. The subject require a mature understanding of statistics and we also recomend TMA4265 Stochastic Processes and TMA4270 Multivariate Analysis.
Academic content: Classical methods for stochastic simulation, Markov chain Monte Carlo methods. Graphical models, networks and Bayesian inference. Bootstrapping, cross-validation and non-parametric methods. Classification.
Teaching methods and activities: Lectures and compulsory exercises on a computer. The lectures may be given in English. Portfolio assessment is the basis for the grade awarded in the course. This portfolio comprises a written final examination 60% and an exercise 40%. The results for the constituent parts are to be given in %-points, while the grade for the whole portfolio (course grade) is given by the letter grading system. Retake of examination may be given as an oral examination.
Course materials: Will be announced at the start of the course.
Assessment: Portfolio assessment

Forms of assessment	Date/Time	Percentage	Exam. support
WRITTEN	To be announced on the web	60/100	C
EXCERCISES		40/100	

MASTER OF SCIENCE IN MATHEMATICS

This International Master´s programme will not be taught in the academic year 2007/2008

The Department of Mathematical Sciences offers a degree programme for two years (120 credits) for the
Master of Science in Mathematics. However, new students will not be enrolled in the academic year 2007/2008 and a new description of the programme will thus be available later. There will probably not be significant changes from the programme for 2004/2005 which was as follows:

Outline of the programme
The Master of Science in Mathematics at NTNU is stipulated to take two years. One year of full studies corresponds to 60 credits, i.e. in total 120 credits are needed. The degree consists of two parts. The programme starts with course work corresponding to 82.5 credits and concludes with writing a thesis corresponding to 37.5 credits.

Aim and description of the course
The Department of Mathematical Sciences offers various courses at graduate level in addition to more specialized graduate seminars. Currently we offer three directions of study, algebra, analysis (functional analysis and complex and harmonic analysis, differential equations) and topology. All students must take at least 30 credits amongst the courses MA3201 Rings and modules, MA3202 Galois theory, TMA4145 Linear methods, TMA4225 Foundations of analysis, TMA4190 Manifolds and 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, Lie-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 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.

As mentioned above, the coursework will take almost 1½ years (87.5 / 60 year). All the courses in the degree must be approved by the Department of Mathematical Sciences, NTNU.

Master´s 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 37.5 credits.

Examination
The examination in each of the courses is either a written examination or an oral examination normally at the end of the semester when the course is taught. However the examination in one course should be taken as a part of the final examination after the thesis has been handed in. This examination is oral. In connection with this examination the student can also be asked questions on the content of the thesis.

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

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.

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.
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. Where the Board of NTNU has established an inter-Faculty board for a group of programmes of study, the latter board is authorized to reach decisions in cases related to exemptions.
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 Universities and 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 Programme 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. When the Board at NTNU has created an inter-Faculty board for a group of programmes of study, this authority is vested in this board. 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:
   - Ex. phil. of 7.5 credits that is to be common for all students. Ex. phil. should ideally be a first semester course but this is not compulsory if there are academic grounds to do otherwise.
   - 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.
   - 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.

§ 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. Where an inter-Faculty board has been established by NTNU to cover a group of programmes of study, this board is responsible for compiling the curriculum. 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 Sections 3-4 and 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 3-4 subsection 3.

§ 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 study of 60 credits and a subsequent, coherent professional study corresponding to 300 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 an examination, he/she has the right to repeat that examination once in one course every academic year in order to improve the grade. In this case, the best grade will count. In cases where the grade is based on a number of partial assessments, all the different components have to be repeated.

§ 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. 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.

§ 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:

Grade	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.

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 credits have to been taken at NTNU. Of the 60 credits, at least 30 must belong to the main educational profile. With regard to a higher degree, the Master's thesis must be part of the 60 credits.

§ 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. With inter-Faculty programmes of study, the supplementary regulations are to be accepted by all faculties involved. When an inter-Faculty board has been established by the Board of NTNU for a group of programmes of study, the supplementary regulations should be decided by the inter-Faculty board.

§ 46 Implementation

These 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.