

Master's Degree Programme in Environmental Sciences

STUDY GUIDE

2008–2009



Faculty of Mathematics and Natural Sciences

University of Turku

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FOR THE READER

This study guide is intended for international students studying for a Master's degree at the Faculty of Mathematics and Natural Sciences. The guide includes Faculty regulations and instructions for students, and the curriculum of the Master's Degree Programme in Environmental Sciences. Curriculum is based on the new Government Decree on University Educations, which will come into force on the 1st of August, 2005.

Information in this guide concerns the academic year 2008–2009. The guide does not include any information about the timetables or the places of the courses. That information can be found on the notice boards or the web sites of the Departments in the beginning of each semester.

Welcome to the Faculty of Mathematics and Natural Sciences!

Hanna Tranberg
Coordinator

DEGREES AND STUDYING AT THE FACULTY OF MATHEMATICS AND NATURAL SCIENCES

General information

In the Faculty of Mathematics and Natural Sciences it is possible to study for the following graduate degrees: Bachelor of Science (*luonnontieteiden kandidaatti*), Master of Science (*filosofian maisteri*) in the field of Natural Sciences, Bachelor of Science in Technology (*tekniikan kandidaatti*) and Master of Science in Technology (*diplomi-insinööri*). The Bachelor's degree is a so called lower university degree and the Master's degree a higher university degree. The studies aiming for the lower and higher university degrees are conducted in degree programmes.

The Faculty of Mathematics and Natural Sciences also awards the following post-graduate degrees: Licentiate of Philosophy (*filosofian lisensiaatti*), Licentiate of Science in Technology (*tekniikan lisensiaatti*), Doctor of Philosophy (*filosofian tohtori*) and Doctor of Science in Technology (*tekniikan tohtori*).

In the Faculty there are 10 degree programmes in Finnish, in which students mainly study for both the lower and higher degree. The degree programmes are: Biochemistry, Biology, Physics, Geology, Chemistry, Geography, Mathematics, Health Biosciences, Information Technology and Master of Science in Technology, Computer Technology. The Faculty also offers three Master's Degree Programmes in English (in Environmental Sciences, Bioinformatics and Information Technology), in which students study only for the higher university degree. Students admitted to these programmes must hold a University degree equivalent to a Bachelor's degree from a Finnish university in an applicable field, and also a good command of English is required.

The unit used for measuring academic work is the ECTS credit point (*opintopiste = op in Finnish*). The average workload for one academic year, 1600 hours, equals to 60 credit points. The workload for one ECTS credit point is about 27 hours.

The Bachelor's degree requires 180 ECTS credits, and the normative study time is three years. The Master of Science and the Master of Science in Technology degrees require 120 ECTS credits, and the normative study time is two years. Students take the lower university degree first and after that go for the higher degree. These are separate degrees and students receive separate degree certificates for them. Study modules which are included in the lower university degree cannot be included in the higher university degree. However, it is possible to study some Master's level courses even if the Bachelor's degree is not yet finished, since all Master's level courses are not organised every year.

Studies are organised in three levels: basic, intermediate and advanced. In the Faculty of Mathematics and Natural Sciences the basic studies modules equal to 25 ECTS credit points. Intermediate study modules are 60 ECTS credits including the basic studies module. The lower university degree includes basic and intermediate studies in the major subject, plus minor subjects as defined in the curriculum of the degree programme.

The advanced studies are included in the Master's degree. The student must complete advanced studies in the major subject or a corresponding entity of the ad-

vanced studies of a degree programme. Advanced studies offer students scientific specific knowledge and prepare for scientific research work.

Advanced studies also include a Master's thesis, known as the *pro gradu*, defining a specific scientific problem, and reporting on the observations, experiments and conclusions carried out in order to solve it. In case a minor subject should be included in the higher university degree, it is specified in the curriculum of the degree programme.

The teaching and learning methods used in the Faculty include attending lectures and demonstrations, reading course literature, and carrying out practical work either at home, in the department, or in the field. Students' work is assessed throughout the year in several different ways, including, for example, book exams, continuous assessment of assignments, and tests at the end of taught courses.

Requirements for the Master of Science (MSc) degree

- a) Advanced studies at least 60 ECTS credits in accordance with the regulations for one of the Faculty's degree programmes (and, where relevant, a specified track)
- b) The Master's thesis (*pro gradu*), in the student's major subject, 20-40 ECTS credits.
- c) Minor subject studies or language studies

Major subjects

Students' major subject depends on the degree programme and the specialisation field or track. The major subject can be different in the lower degree and the higher degree. In the English Master's Degree Programmes the tracks and major subjects are following:

DEGREE PROGRAMME	SPECIALISATION FIELD / TRACK	MAJOR SUBJECT
Master's Degree Programme in Environmental Sciences	Ecotoxicology	Environmental science
	Geoinformatics in Environmental Research	Environmental science
	Quaternary Paleoecology and Environmental Change	Environmental science
	Tropical Environments and Development	Environmental science
Master's Degree Programme in Information Technology	Computing	Computer science
	Electronics and Communication Systems	Electronics and Communication Systems
	Mathematics	Mathematics
Master's Degree Programme in Bioinformatics	Bioinformatics	Bioinformatics

Minor subjects

There are compulsory and optional minor studies included in the degree studies. Each degree programme's requirements are specified in its curriculum. Usually the higher university degree does not include any minor subjects. In case a minor subject is required, it should be planned with the academic advisor when making the personal study plan.

Students have the right to study more credits than the minimum degree requirements. Study modules which are more than 12 ECTS credits will be recorded in the degree certificate as a minor subject. To get a minor subject from another specialization field in the Master's Degree Programme in Environmental Sciences a minimum of 25 ECTS credits is needed. Otherwise the studies from another field will be included in the Major subject module.

Language and communication studies

According to the regulations governing the Faculty's degrees and approved by the Faculty Council, all foreign students whose native language is not Finnish have to pass Finnish language courses worth at least 5 ECTS credits. Courses can be freely chosen from those available. Please find more information from the Language Center study guide or from their web site: <http://kielikeskus.utu.fi/>. It is also possible to study additional language studies, even though they are not included in the curriculum. Especially Finnish language courses are recommended, since knowledge in Finnish is very important when finding employment in Finland.

All students with Finnish education background (suomenkielinen peruskoulu) must pass *virkamiesruotsi* (KIRU2321 and KIRU2341) either in their BSc. or MSc. Degree (Valtion virkamieheltä kaksikielisellä kielialueella vaadittava kielitaito siitä annetun lain (424/2003) 6§:n 1 momentin mukaan.)

Personal study plan (HOPS)

Starting from 2005, all students will make a personal study plan. The system of personal study plans increases students' guidance and promotes advancement in studies. In the beginning of the studies the personal study plan is made with the coordinator of the programme. Later, and especially on the issues concerning practical courses and Master's Thesis, the students can also turn to academic advisors on the departments. The personal study plan is not a written agreement on the completion of studies. Instead, it is an indicative plan about the content of the degree and studies included in it. Students can complement and modify this plan during their studies. Students are responsible for keeping, updating and implementing their own personal study plans. A personal study plan may be drawn up electronically or as a hard copy.

Right to study

Students must register each academic year for attendance or absence in the manner defined by the Rector's Office. Students who are currently registered will be sent a registration letter in the spring to the address recorded in the student record. In case

a student fails to register, s/he will lose her/his right to study. If a student wishes to start his/her studies at a later date or continue with them, s/he must literally apply for a new right to study.

According to the Universities Act (556/2005) those students who have started to study in a university in 2005 or later have the right to study for a degree for four years. The university must arrange the education to enable the student to complete the degree in two years of full-time studies, which is the normative study time.

Four years study time does not include absences that are due to military service, maternity leave or other parental leave of absence. Nor does it include absences less than four semesters, when a student has registered absent. The University can allow more time to complete the studies, if a student presents a feasible study plan of completing her/his studies. Otherwise a student will lose her/his right to study.

Academic teaching periods

The academic year at the University of Turku is divided into four teaching periods. In the academic year 2008–2009 the periods are as follows:

I period 1.9.2008 - 26.10.2008

II period 27.10.2008 - 21.12.2008

III period 12.1.2009 - 8.3.2009

IV period 9.3.2009 - 10.5.2009

The last week of each period is for exams and no lectures or other contact hours should be held then. Examinations and some special courses (such as field courses) can be arranged outside teaching periods.

Participation in teaching

For lecture courses, registration is normally not required. For smaller groups (demonstrations, field courses, etc.) students usually need to register, and for elective or optional courses it may in some cases be necessary to limit the number of those admitted. Detailed information about registration for classes can be found on departmental notice boards or web-sites.

Students' work may be assessed on the basis of continuous assessment (assignments during a course), tests during or following a taught course, or 'book exams' on specified scientific literature.

Following every taught course, at least three opportunities to take or re-take the relevant test will be provided during the following twelve months. In certain, specific cases, admission to the test for a lecture course may also require active participation in the linked demonstrations. If, after 12 months, a student has either not attended the tests or has failed to pass, he or she may be required to report to the examiner in person. The examiner may then either extend the student's right to take the test, or require the student to re-take the course. The timing of book exams can usually be chosen more freely, allowing students to individually pace their own work during the year.

Detailed instructions about registering for tests and examinations can be found on departmental notice boards or web-sites. Information concerning the names of examiners responsible for different courses and examinations is available in the published degree programme regulations or from the relevant department office.

All results for completed study units (courses, examinations, and thesis) are recorded in 'OPSU', the University's computerised student register, either by the department office or by the examiner. Students may obtain an English transcript of their current status in OPSU via e-mail from the address transcript@utu.fi or by ordering it from the Student Services or the department office.

Grading

All courses are measured in credits, one credit point (abbreviated *op* in Finnish) referring to an input of approximately 27 overall hours of work by the student. This workload includes all the requirements for a course: not only attending lectures and practicals, but the time spent studying privately as well. The average number of credits completed in one semester is 30–40 *op*.

Examinations, tests and assignments may be assessed either on a PASS/FAIL basis, or on the following scale:

- 5 = Excellent
- 4 = Very good
- 3 = Good
- 2 = Satisfactory
- 1 = Sufficient
- 0 = Fail

Grades are determined and rounded up as follows:

5	4.50 to 5	Excellent
4	3.50 to 4.49	Very good
3	2.50 to 3.49	Good
2	1.50 to 2.49	Satisfactory
1	1 to 1.49	Sufficient

Where a study unit comprises several distinct sections, they may be differentially weighted in the assessment for the unit as a whole. Test and examination results should normally be published within two weeks, unless special arrangements have been made. Students have the right to be provided upon request an explanation of the grounds for the assessment.

Master's Thesis

The Master's thesis for the MSc degree (*pro gradu*) is a written report of research carried out in the student's major subject, comprising laboratory work, field work, and/or the study of relevant scientific literature. The thesis should demonstrate that the author is capable of dealing competently with the research material and applying appropriate research methodology, is familiar with the relevant literature, and can present the results in accordance with the conventions of scientific writing. The topic

for the thesis should be agreed in consultation with a professor or other senior member of staff from the subject concerned.

The Master's thesis should be at least 20 and at most 40 credits. It can be written in Finnish, Swedish or English. It can also be written in some other language with the permission of the Dean of the Faculty.

When the thesis is ready, a hard covered copy of it must be submitted to the department office (in some cases more copies may be needed). As specified in the regulations, a summary of the thesis must be prepared. A copy of this summary is bound in the thesis immediately after the title page; an additional separate copy is submitted to the department office. The department will then appoint two (or if necessary more) examiners.

After submitting the Master's thesis, the student must write a maturity essay (in Finnish, *kypsyysnäyte*), in which the student writes an essay in examination conditions on a topic relating to his/her thesis. Finnish nationals write this essay in their own first language; foreign students write it in the same language as the Master's thesis. The maturity essay must show the student's ability in academic writing and his/her thorough knowledge of the topic of the thesis.

The Master's thesis must be graded within two months after submission to the department. In case the thesis is submitted in June, July or August, it will be graded during the following September at the latest. The pro gradu thesis is assessed on a seven-point scale: approbatur (pass), lubenter approbatur, non sine laude approbatur, cum laude approbatur, magna cum laude approbatur, eximia cum laude approbatur, and laudatur (distinction). The department informs the Faculty about the approval of the Master's thesis.

The grading of the Master's thesis will be considered as part of the advanced studies by changing the seven-point scale into 1-5 point scale as follows: approbatur = 1, lubenter approbatur = 2, non sine laude approbatur = 3, cum laude approbatur = 3, magna cum laude approbatur = 4, eximia cum laude approbatur = 5, and laudatur = 5.

Completing the degree and obtaining a degree certificate

Once a student has fulfilled all the requirements for the degree, in order to obtain the degree certificate, it is necessary that all the student's completed study units (tests and examinations, fieldwork, and the thesis) have been registered in OPSU and, where relevant, incorporated into the appropriate Module. **To ensure that this process is complete, students should consult the department or the coordinator of the programme.** The student then submits to the Faculty office a degree certificate application form and a transcript of studies. The decisions about any course compensations on changes made into the degree requirements must also be attached. The time needed for processing a degree certificate application is normally about two weeks.

In order to obtain a degree certificate, the student **must** be registered as currently attending the University at the time when the certificate is issued.

The degree certificate

The certificates state the student's Degree Programme, major subject and minor subjects, and track, where relevant. The total amount of studies completed will be stated in ECTS credits (op), including relevant studies completed elsewhere and incorporated into the Finnish degree. The credits completed are also listed and assessed separately for the student's major and for all minor subjects. Any study units outside these categories which are less than 12 ECTS credits will be listed together on the degree certificate as 'Other Studies', with the number of credits but no other information. The certificate will also state the grade awarded for the Master's thesis.

The degree certificate has two appendices. One is the transcript of records, which will list the student's completed study units as recorded in OPSU, and will also state the title of the Master's thesis. The other is the Diploma Supplement, an appendix designed for international purposes. It is a document developed by the European Commission, Council of Europe and UNESCO for facilitating the international recognition and comparison of degrees. This appendix contains information on the university awarding the degree, on the studies and completed courses referred to in the degree certificate, on the qualification obtained through the studies, as well as on the level and status of the degree in the international educational system.

Statutes

The regulations governing the Faculty's degrees and its administration are contained in statutes which are either national or apply specifically to the University of Turku or the Faculty of Mathematics and Natural Sciences. These documents are all public and may be consulted, but not all of them are available in English. In the case of any problem requiring reference to the statutes, foreign students are advised to apply for help from their department office, the Faculty office, or the University's International Office.

The University Act is available at the website <http://www.finlex.fi/fi/laki/kaannokset/> (2005) and The Government Decree on University Degrees at <http://www.finlex.fi/fi/laki/kaannokset/2004/en20040794.pdf>

Transfer of credits

If the student has previous studies that are not included in his/her BSc level degree, the studies may be transferred into the Finnish system. International credit transfers are made wherever possible by means of the European Credit Transfer System (ECTS). One Finnish credit (op) equals one ECTS credit. In many cases, incoming students in this situation will need to complete less than 120 ECTS studies in order to obtain the Finnish MSc degree. Even when credits are transferred in to a degree, the degree programme must reach its aims that are stated in the regulations governing the Faculty's degrees.

The transfer of credits can be either *replacing* or *including* credits. *Replacing* credits means that it is possible to replace certain study modules in the curriculum with modules passed in another university. In this case the content of the study modules

should be the same. *Including* credits means that the study modules passed in another university are included in the degree as optional studies.

Right of study in other Faculties and Institutes of Higher Education

It is possible for a student to select studies in other scientific institutes or art academies of higher education in Finland. The University of Turku has concluded a so called JOO-agreement with all Finnish universities, which means that study modules in another university are free of charge for an enrolled student. The permission to select courses from another university will be given by the Head of the Student and Academic Affairs in the Faculty office. The permission is not given, in case it is possible to study same study modules at the University of Turku, or the studies are not included in the minimum degree requirements.

In the field of information technology, education and research in Turku is coordinated by TUCS (Turku Centre for Computer Science). Students should apply for IT-related advanced level courses at Åbo Akademi University or Turku School of Economics and Business Administration by using a separate application form, which is available on TUCS web site <http://www.tucs.fi>.

Students can also study part of their degree in a foreign university through an exchange programme such as ERASMUS or NORDPLUS. Students can find out more information about student exchange from the International Officer of the Faculty (kvml@utu.fi). The Faculty of Mathematics and Natural Sciences recommends that the students of the Master's Degree Programmes would participate in the student exchange for one semester at the most.

The aims of the Master's Degree Programme in Environmental Sciences

The aim of the Master's Degree Programme in Environmental Sciences is to offer:

- 1) A multidisciplinary and extensive view of environmental sciences and their socio-economical connections;
- 2) Specialization and profound scientific knowledge in a selected field of environmental sciences;
- 3) Advanced knowledge in global environmental issues and basic knowledge in multi-lateral environmental agreements;
- 4) Advanced scientific knowledge and practical skills in data management and environmental analysis;
- 5) Ability to collect, critically evaluate and use research material;
- 6) Competence for postgraduate studies in the selected field.

MASTER'S DEGREE PROGRAMME IN ENVIRONMENTAL SCIENCES

Objectives

The Master's Degree Programme in Environmental Sciences educates environmental specialists that hold an extensive view of environmental issues. All students are given the basic knowledge in environmental problems and multilateral environmental agreements, and they also achieve advanced scientific knowledge and practical skills in data management and environmental analysis. Education is given in English, and the students of this international programme learn to work together with associates from different countries and cultures. Graduates of the programme are competent in basic and applied research, and will also find employment in tasks related to environmental assessment and administration as well as in commercial activities and economic life. The Master of Science (MSc) degree also gives eligibility for scientific postgraduate studies.

Participating units and interdisciplinary specialisation fields

The programme covers different interdisciplinary specialization fields that are managed by three Departments at the Faculty of Mathematics and Natural Sciences: Department of Biology, Department of Geology and the Department of Geography. As a cooperation of these participating units, the programme offers specialization studies in:

- Ecotoxicology
- Geoinformatics in Environmental Research
- Quaternary Paleoecology and Environmental Change
- Tropical Environments and Development

Entrance qualifications

Both foreign and Finnish students admitted to the programme must hold a degree equivalent to a Bachelor's degree from a Finnish university. The degree should be in an applicable field e.g. biology, biochemistry, chemistry, geography, geology, environmental science or earth science, and correspond to 180 ECTS at an institution of higher education. A good command of English is also required.

Structure of studies

The applicants choose the preferred specialisation field already in pursuance of the application procedure. The students are selected directly into the specialisation field, and become registered in the coordinating Department.

The MSc degree is attained in two years. The studies encompass many aspects of environmental sciences and consist of lectures, seminars and experimental field and laboratory courses. In the beginning of the programme, each student will formulate an individual study plan with the help of an advisor. The curriculum includes common studies (25 credits), advanced studies in the specialisation field (about 55 credits), an extensive Master's Thesis (40 credits) and possibly also some auxiliary studies to attain 120 credits.

In the Finnish system, all courses are measured in credits, *opintopiste* (op) in Finnish. One credit refers to an input of approximately 27 hours of work for the attainment of set objectives for a course. At the University of Turku one Finnish credit equals 1 ECTS credits starting Autumn term 2005. In this curriculum credits are marked as ECTS credits, which is used as a translation of *opintopiste*.

COMMON STUDIES

COMMON STUDIES (25 ECTS)

YMPS6046	Introduction to Environmental Sciences at the University of Turku	2 ECTS
MAAN6081	Introduction to Cartography and Geoinformatics	4 ECTS
YMPS6047	Environmental agreements and project management	2 ECTS
YMPS6048	Fundamentals of Environmental Sciences	4 ECTS
GEOL1112	Resources of the Earth	2 ECTS
YMPS6043	Conservation biology	2 ECTS
YMPS1039	Research Seminar in Environmental Sciences	4 ECTS
KIxxXXXX	Language Studies: finnish or <i>virkamiesruotsi</i>	5 ECTS

The common studies are mainly obligatory for all students in the Master's degree programme in Environmental Sciences. However, there are a few exceptions:

- The students in the field Geoinformatics in Environmental Research may compensate the course Introduction to Geoinformatics (MAAN6053) with Literature in Geoinformatics (MAAN6453, Jones C. (1997) *Geographical information systems and computer cartography*)
- All foreign students whose native language is not Finnish must pass Finnish language courses (KIFF0003) worth at least 5 credits. Finnish students are excused for the course and may instead complete their common studies with courses on their specialization field.
- All students with Finnish education background (suomenkielinen peruskoulu) must pass *virkamiesruotsi* (KIRU2321 and KIRU2341) either in their BSc. or MSc. Degree (Valtion virkamieheltä kaksikielisellä kielialueella vaadittava kieli-taito siitä annetun lain (424/2003) 6§:n 1 momentin mukaan.)

Please also note that previous knowledge or supplementary studies are required in statistics.

ECOTOXICOLOGY

The field focuses on mechanisms of toxicity. One of the major foci of research is investigating how environmental adaptations at the genetic and physiological (individual) level are disturbed by environmental contamination. Specifically, effects of oxidative stresses on gene expression are investigated using the Baltic Sea and the Fennoscandian shield as major research areas. Since oxidative stress is studied the research comprises, e.g., metal toxicity, toxicity of organic compounds (e.g. PAH), oil pollution and uv-radiation. The main taxonomical groups investigated are fish, amphibians and birds but suitable work on plants and prokaryotes is included. The students are expected to integrate into the existing research groups within aquatic toxicology, conservation genetics or environmental biology of birds to carry out their thesis work.

The teaching given represents principles required for understanding how environmental contamination may affect environmental responses of individuals, how individual responses can be transmitted to the population and ecosystem level via genetic mechanisms and what are the chemical methods used for determining and pathways involved in exerting the effects of environmental contamination.

An indication of the role of University of Turku in ecotoxicology is that the chief editor of Aquatic Toxicology works in the Department of Biology. In addition the recent active research has been concentrated in finding out the effects of environmental contamination on birds and their invertebrate prey. Future foci include conservation genetics and the influence of environmental contaminants on the genetic mechanisms of local adaptations.

Coordinating unit: Department of Biology

Cooperation with: Finnish Marine Institute, the Turku University Environmental Research Institute, Åbo Akademi University, Finnish Game and Fisheries Research Institute and University of Stockholm.

	Common Studies	25 ECTS
	Lectures and seminars	39 ECTS
ESCE0008	Principles of Ecotoxicology	2 ECTS
ESCE0001	Readings in Environmental Physiology of Animals	6 ECTS
ESCE0002	Readings in Ecology	6 ECTS
ESCE0003	Seminars in Toxicology	4 ECTS
FYGExxxx	Studies in population and conservation genetics	2 ECTS
ESCE0004	Final examination (literature on toxicology)	19 ECTS
	Practicals	13 ECTS
ESCE0005	Methods in molecular and genotoxicology	4 ECTS
ESCE0006	Modelling and evaluating toxicological data sets	4 ECTS
ESCE0007	Census and survival analysis of vertebrate populations	5 ECTS
	Optional courses	3 ECTS
ESCE0010	Thesis	40 ECTS

GEOINFORMATICS IN ENVIRONMENTAL RESEARCH

The field focuses on environmental applications of remote sensing, geographical information systems (GIS) and environmental information services. The focus is both in the skills of using the methods as such, but particularly in the student's ability to apply these geoinformatics methods in various environmental research projects. Furthermore, the spatial data infrastructure and policy issues, particularly related to environmental information, will be addressed in this curriculum.

Methods in geoinformatics have been successfully applied in several research projects at the University of Turku. These include biogeographical, geomorphological and landscape research, analysis and modelling of geographical processes, environmental monitoring and integrated coastal zone management. The University also takes part in diverse national and international environmental information initiatives and networks. Further details at www.utu-lcc.utu.fi.

Coordinating unit: Department of Geography

Cooperation with: Department of Biology, Department of Geology, Turku University Environmental Research Institute and the Geological Survey of Finland.

	Common studies	25 ECTS
	Lectures, practical and seminars	19–27 ECTS
MAAN6452	Methods in remote sensing and image interpretation	7 ECTS
MAAN6451	Methods in geographical information systems (GIS)	7 ECTS
MAAN6453	Literature in geoinformatics	2 ECTS
MAAN7655	Literature in applied geoinformatics	2–8 ECTS
MAAN7154	MSc thesis seminar in physical geography	1–3 ECTS
	Optional courses	28–36 ECTS
MAAN7351	Landscape Ecology and GIS	6 ECTS
MAANxxxx	Guest lectures and seminars in geoinformatics	2–4 ECTS
MAAN7352	Environmental management	3 ECTS
MAAN7663	GIS and society	2 ECTS
	Optional courses offered by the Department of Geology	
	Optional courses offered by the Department of Biology	
	Optional courses offered by Finnish virtual university of geoinformatics, large selection, see http://virtuaali.tkk.fi/geoinformatiikka/	
MAAN7951	Thesis	40 ECTS

Please note: Students with background studies in Geoinformatics may replace the Basic course in Geoinformatics with Literature in Geoinformatics (MAAN6453, Jones C. (1997) *Geographical information systems and computer cartography*)

Background knowledge is required in the Basics of cartography and geoinformatics and in the Basics of statistics. It is possible to participate in these supplementary courses also at the University of Turku.

QUATERNARY PALEOECOLOGY AND ENVIRONMENTAL CHANGE

Within this interdisciplinary field, paleogeological research is combined with the Biological Museum's extensive knowledge in the taxonomy of animal and plant groups. Education represents the core area in paleoecological research and focuses on environmental history and quaternary geology, including analytical physical and chemical methods as well as practicals in the taxonomy of different subfossil groups.

Being rich in lakes and marshes and extensive glacial record, Finland is traditionally known as an area with exceptionally favourable chances to do paleoecological research. At the University of Turku, paleoecological education and research is partly directed to the unique Finnish Archipelago and to the Kevo Subarctic Research Center in the Finnish Lapland.

Paleoecological research has a central role in several international research programmes, including the past Global Change (PAGES) of the International Geological Correlation Programme (IGCP), European Science Foundation in Holocene Climatic Variability (Holivar) and International Quaternary Association in Commission of Human Evolution Paleoecology. All these projects aim in increasing quantitative knowledge in the global change of the earth's recent history, to make it possible to estimate changes in the atmosphere caused by human action.

Coordinating unit: Department of Geology

Cooperation with: Department of Biology and the Turku University Environmental Research Institute.

	Common studies	25 ECTS
	Lectures and seminars	21 ECTS
GMAA4805	Quaternary geology	6 ECTS
GMAA4814	Glacial stratigraphy	4 ECTS
GMAA4816	Physical and chemical methods of lacustrine and marine sediments	5 ECTS
GMAA4737	Environmental history: natural sciences perspective to anthropogenic influence	4 ECTS
GMAA4735	Environmental archaeology	2 ECTS
	Optional courses	19 ECTS
GMAA4732	Quaternary environmental changes	2 ECTS
GMAA4730	Practical image analysis in Quaternary paleolimnology	2 ECTS
	Other optional courses offered	
	Practicals	15 ECTS
GMAA4736	Laboratory Practical Works in Glacial and Quaternary Geology	8 ECTS
GMAA4722	Lake and sea sediment surveys	7 ECTS
GMAA4675	Thesis	40 ECTS

TROPICAL ENVIRONMENTS AND DEVELOPMENT

This field focuses on interdisciplinary approaches to understand tropical ecology, biological resources management and sustainable development at local, national and global levels. Within this interdisciplinary field, biological research including taxonomy and systematics, ecology and limnology is combined with current issues in biodiversity and bio-geographical approaches. Furthermore, basic skills in project cycle management related to international development programmes implementing multilateral environmental agreements (MEAs) will be provided. In addition, the main development policies adopted by donating governments will be discussed.

Education represents the core area in biological resources management in the tropics, including biodiversity inventory and assessment techniques, taxonomic research methods, tropical ecology as well as practicals related to international development project cycle management. Development and environment related courses will introduce students to the concepts and theories of sustainable development and examine development questions from an interdisciplinary point of view.

At the University of Turku, biodiversity research has a strong international focus, especially in the Western Amazon area. For example, the UTU-ART team is an interdisciplinary research team with activities in tropical America. Education and research is partly directed towards material collected from the Western Amazon area as well as ongoing work in Latin America and elsewhere in the tropics.

Coordinating unit: Department of Biology

Cooperation with: Department of Geography, Department of Geology, and the Turku University Environmental Research Institute.

	Common studies	25 ECTS
	Lectures and seminars	29–31 ECTS
EKOL3150	Tropical plant families	4 ECTS
EKOL3113	Tropical limnology	4–6 ECTS
YMPS6002	Environment and Development	2 ECTS
MAAN7081	Project management and seminar	5 ECTS
EKOL3132	Advanced issues in biodiversity research	4 ECTS
EKOL3008, EKOL3009	Final examinations	10 ECTS
	Optional courses	24–26 ECTS
YMPS6044	Environment and Development in East Asia	2–6 ECTS
EKOL3004	Visitor seminar	2 ECTS
EKOL3141	Advanced Conservation Ecology	6 ECTS
EKOL3135	Biodiversity Informatics	2 ECTS
EKOL2311	Geographical plant ecology I	4 ECTS
EKOL2315	Geographical plant ecology II	4 ECTS
EKOL3134	Use of GIS and Remote Sensing in Studying Biodiversity	2 ECTS
EKOL3001	Research project on tropical issues or on biodiversity assessment	10–15 ECTS
	Other optional courses according to the personal study plan	
EKOL3012	Thesis	40 ECTS

COURSE DESCRIPTIONS

COMMON STUDIES

YMPS6046 Introduction to Environmental Sciences at the University of Turku

Subject: Environmental Sciences

Credits: 2 ECTS

Objectives: This course aims to give students an overview of the entire range of environmental research within the University.

Content: Different research groups will give presentations of their research topics, methods and results.

Teaching methods: Lectures and independent work

Modes of Study: Essay / Learning diary

Time: 1 period

Evaluation: Numerical scale (0–5)

Organization responsible: Dept. of Biology, Environmental Sciences

Person in charge: Professor Timo Vuorisalo, timovuo@utu.fi

MAAN6081 Introduction to cartography and geoinformatics

Subject: Geography

Credits: 4 ECTS (in Finnish also a 8 ECTS packet available)

Objectives: The aim of the course is that the students understand the basic concepts and methods of cartography and geoinformatics in geographical applications and in the society at large. These include remote sensing, map projections, coordinate systems, positioning technologies, databases, Geographical Information Systems (GIS) and cartographic communication. The student knows where geographical data can be obtained, is able to evaluate the quality and content of the data sets and knows how to use them, including interpretation, storage, queries, analyses and presentation of geographical information cartographically and numerically.

Content:

- geographical information and data sets
- history and development of cartography
- map projections and coordinate systems
- remote sensing
- databases and statistical data
- Geographical Information Systems (GIS)
- positioning technologies and applications
- geographical analyses and interpretation
- cartographic communication and visualization
- Internet map services

Study materials: lecture notes and readings, practical material, virtual material (internet)

Website: <http://www.sci.utu.fi/maankurssit/MAAN6081>

Teaching methods: Lectures, seminars and demonstrations (participation required), practical (participation required), group discussions (participation required), self-studying

Modes of Study: exercises and portfolio, participation in classroom work (group discussions), written exam

Previous studies: Sufficient skills in computing (excel, word, university network, internet browsing, image processing) are required.

Language of instruction: Finnish (4 or 8 ects), English (4 ects)
Time: II–III period
Evaluation: Numerical scale (0–5), with written exam 50 % and portfolio 50 %
Organization responsible: Department of Geography
Person in charge: Senior assistant Niina Käyhkö, niina.kayhko@utu.fi and Lecturer Sanna Mäki, sanna.maki@utu.fi

YMPS6047 Environmental agreements and project management

Subject: Environmental Sciences
Credits: 2 ECTS
Objectives: To familiarize students with the development and rules of international environmental law, and on practical problems of environmental projects in developing countries.
Content: The course includes lectures on the formation, structure and importance of international environmental agreements, their historical background and current importance in international cooperation. Analysis of environmental projects in developing countries will be based on case studies.
Teaching methods: Lectures
Modes of Study: 80% participation to lectures, course reports.
Time: II period
Evaluation: Numerical scale (0–5)
Organization responsible: Dept. of Biology, Environmental Sciences
Person in charge: Professor Timo Vuorisalo, timovuo@utu.fi

YMPS6048 Fundamentals of Environmental Sciences

Subject: Environmental Sciences
Credits: 4 ECTS
Objectives: The book provides updated information on global environmental problems.
Content: Miller G. Tyler Jr: Living in the Environment. Principles, Connections and Solutions. Thomson, Brooks/Cole, 2005 (or more recent edition).
Teaching methods: Independent work
Modes of Study: Written exam
Time: I–IV periods
Evaluation: Numerical scale (0–5)
Organization responsible: Dept. of Biology, Environmental Sciences
Person in charge: Professor Timo Vuorisalo, timovuo@utu.fi

GEOL1112 Resources of the Earth

Subject: Geology
Credits: 2 ECTS
Objectives: Provide basic knowledge and understanding of resources of the earth.
Content: This course gives fundamental knowledge on the wide spectrum of non-renewable mineral, energy and water resources that exist on the earth, including metaliferous mineral deposits, industrial minerals, building stones, gravel, sand, soil, water, coal, oil and gas. Resources and reserves as well as geographical and geological distribution will be defined and discussed together with consumption patterns and environmental aspects of resource exploitation.
Teaching methods: Theoretical examinations
Modes of Study: Press, F. & Siever, R. (1998): Understanding Earth tai Marshak, S., (2005): Earth, Potrait of a Planet
Time: II period

Evaluation: Numerical scale (0–5)
Organization responsible: Dept. of Geology
Person in charge: Professor Krister Sundblad, krister.sundblad@utu.fi

YMPS6043 Conservation Biology

Subject: Environmental Sciences

Credits: 2 ECTS

Objectives: This course familiarizes students with fundamentals in conservation biology.

Content: The course includes lectures on global extinction patterns, consequences of small population size, species invasions, habitat and population fragmentation and conservation planning.

Teaching methods: Lectures (24 h)

Modes of Study: Active participation to lectures and successful completion of the exam

Time: II period

Evaluation: Numerical scale (0–5)

Organization responsible: Dept. of Biology, Environmental Sciences

Person in charge: Professor Timo Vuorisalo, timovuo@utu.fi

YMPS1039 Research seminar in Environmental Sciences

Subject: Environmental Sciences

Credits: 4 ECTS

Objectives: To practice oral presentations within a multidisciplinary group of students.

Content: Seminar consists of presentations given by the students who attend the course. If possible, presentations should be based on the students' own Master's thesis works.

Teaching methods: Seminars

Modes of Study: Active participation in seminars, one seminar presentation

Time: III period

Evaluation: Numerical scale (0–5)

Organization responsible: Dept. of Biology, Environmental Sciences

Person in charge: Professor Timo Vuorisalo, timovuo@utu.fi

KIFF0003 Studies in languages and communications / Intensive Finnish for Beginners

Subject: Finnish for foreigners

Credits: 5 ECTS

Objectives: The aim of the course is to reach a basic knowledge of Finnish language and culture and to promote the ability to cope with some everyday situations.

Content: The course is integrated and covers all the different areas of linguistic skills: pronunciation and grammar, speaking, written work and listening and reading comprehension. 60 h, 6h/week, Textbook Hyvin menee! and vocabulary

Modes of Study: participation in classroom work (at least 80%), intermediary and final exam

Time: I–II period

Evaluation: Numerical scale (0–5)

Organization responsible: Language centre (Kielikeskus)

Person in charge: Lecturer Pirkko Hölttä, pirkko.holtta@utu.fi

ECOTOXICOLOGY

ESCE0008 Principles of Ecotoxicology

Subject: Ecotoxicology

Credits: 2 ECTS

Objectives: To introduce students to the field of ecotoxicology.

Content: Topics covered include the uptake, biotransformation and excretion of chemicals in organisms, the principal effects of environmental contamination on living systems and the application of biomarkers in environmental toxicology.

Teaching methods: Lectures (instead of lectures the book Introduction to Ecotoxicology by D. Connell et al., 170 pp, 1999 can be used)

Modes of Study: Written exam

Time: I period

Evaluation: Numerical scale (0–5)

Organization responsible: Dept. of Biology, Section of Genetics and Physiology

Person in charge: Professor Mikko Nikinmaa, miknik@utu.fi

ESCE0001 Readings in Environmental Physiology of Animals

Subject: Ecotoxicology

Credits: 6 ECTS

Objectives: To ensure that the students have basic knowledge on physiological processes affected by the environment.

Content: Topics covered include mechanisms of animal function and how these can be affected by the environment. Examination of Willmer et al. Environmental Physiology of Animals, 2nd edition, 768 pp, 2004

Teaching methods: Independent studying for a book examination.

Modes of Study: Successful completion of a written exam

Time: I–IV periods

Evaluation: Numerical scale (0–5)

Organization responsible: Dept. of Biology, Section of Animal Physiology

Person in charge: Professor Mikko Nikinmaa, miknik@utu.fi

ESCE0002 Readings in Ecology

Subject: Ecotoxicology

Credits: 6 ECTS

Objectives: To ensure that the students have basic knowledge on ecological processes affected by the environment.

Content: Topics covered include the ecology of individuals, populations and communities. Examination of Begon et al. Ecology, 4rd edition, 2005 (ISBN 1405111178)

Teaching methods: Independent studying for a book examination.

Modes of Study: Successful completion of a written exam.

Time: I–IV periods

Evaluation: Numerical scale (0–5)

Organization responsible: Dept. of Biology, Section of Genetics and Physiology

Person in charge: Professor Mikko Nikinmaa, miknik@utu.fi

ESCE0003 Seminars in Toxicology

Subject: Ecotoxicology

Credits: 4 ECTS

Objectives: To give the students a picture of current toxicological research.

Content: Students read and present recent ecotoxicological articles. Occasionally guest lecturers present a topic.

Teaching methods: Weekly journal club, occasional guest lectures

Modes of Study: Active participation in the seminar. Every student presents an article once a week through one academic year

Time: I–IV periods

Evaluation: pass/fail

Organization responsible: Dept. of Biology, Section of Genetics and Physiology

Person in charge: Professor Mikko Nikinmaa, miknik@utu.fi

ESCE0004 Final examination(s)

Subject: Ecotoxicology

Credits: 19 ECTS

Objectives: To ascertain that the students have knowledge on toxicological literature.

Content: The content of the books determines the area covered.

Teaching methods: Examination of books chosen together by the student and the professor in charge

Modes of Study: Successful completion of the examination

Time: I–IV periods

Evaluation: Numerical scale (0–5)

Organization responsible: Dept. of Biology, Section of Genetics and Physiology

Person in charge: Professor Mikko Nikinmaa, miknik@utu.fi

ESCE0005 Methods in molecular and genotoxicology

Subject: Ecotoxicology

Credits: 4 ECTS

Objectives: The aim of the laboratory course is to introduce the methods commonly in use in measuring molecular and genetic disturbances caused by environmental toxicants.

Content: The methods presented vary according to the expertise of course instructors, but include methods to assess changes in gene expression and oxidative stress, cell viability assays, micronucleus tests and methods in ecotoxicogenomics.

Teaching methods: Lectures, experimental work, writing of lab notes.

Modes of Study: Active participation in lab work, successful completion of the course report.

Time: II period

Evaluation: pass/fail

Organization responsible: Dept. of Biology, Section of Genetics and Physiology

Person in charge: Professor Mikko Nikinmaa, miknik@utu.fi, Coordinator Hanna Tranberg, hakanu@utu.fi

ESCE0006 Modelling and treatment of toxicological data

Subject: Ecotoxicology

Credits: 4 ECTS

Objectives: The aim of the course is to introduce methods and endpoints commonly used in modelling the effects of environmental toxicants and to introduce methods used in evaluating toxicological data based on material/data given in the beginning of the course.

Content: The students evaluate and use earlier gathered data sets to practically analyze the different endpoints and their utility in toxicological research and regulatory ecotoxicology

Teaching methods: Through practical (mainly computer) work acquaint the students on how to use data obtained in toxicological research. The students participating in this course can choose the timetable (during the spring term) fitting each individual (work is carried out in pairs)

Modes of Study: Successful completion of given tasks (practical calculations/modeling)

Time: III–IV period

Evaluation: pass/fail

Organization responsible: Dept. of Biology, Section of Genetics and Physiology

Person in charge: Professor Mikko Nikinmaa, miknik@utu.fi

ESCE0007 / EKOL3125 Census and survival analysis of vertebrate populations

Subject: Ecotoxicology

Credits: 5 ECTS

Objectives: Learn to understand estimation of population size and use state-of-art programs for analyzing population dynamical data.

Content: Census methods, modeling of census data, modeling and analysis of survival data in different situations, analysis of monitoring data. The approaches learned are mainly intended for vertebrate studies.

Modes of Study: Written exam, practicals and participation in classroom work

Time: III period, held next time in spring 2009

Evaluation: pass/fail

Organization responsible: Dept. of Biology, Section of Ecology

Person in charge: Lecturer Esa Lehtikoinen, esa.lehtikoinen@utu.fi

ESCE0010 Thesis

Subject: Ecotoxicology

Credits: 40 ECTS

Objectives: To introduce the students in practical research and academic writing.

Content: The student carries out practical research and writes the thesis on a topic agreed with the supervisor. Before the thesis can be evaluated, the student must also write a maturity essay on one topic of the thesis. The maturity essay is evaluated on pass/fail –scale.

Teaching methods: Practical and written work

Modes of Study: Successful completion of the thesis.

Time: I–IV periods

Evaluation: Scale approbatur–laudatur

Organization responsible: Dept. of Biology, Section of Genetics and Physiology

Person in charge: Professor Mikko Nikinmaa, miknik@utu.fi

GEOINFORMATICS IN ENVIRONMENTAL RESEARCH

MAAN6451 Methods in Geographical Information Systems

Subject: Geography

Credits: 7 ECTS

Objectives: The aim of the course is that the students obtain advanced theoretical and applied knowledge on different geographical analysis techniques in GIS, including how to describe, evaluate, manage, analyse and visualise geographical information with raster and vector models. Student will obtain skills in using different types of geographical data sets and analyses techniques available in the GIS software ArcGIS.

Content: - revising principles for geographical phenomena and analyses

- databases and geographical data models
- geographical and attribute data management
- data quality and interoperability
- spatial interpolation principles and applications
- neighbourhood analyses techniques
- overlay analyses methods
- spatial modeling
- network analyses
- visualisation

Study materials: Lecture and demonstrations notes, distributed literature, practical material (instructions and portfolio) and virtual resources via the Internet

Website: http://www.sci.utu.fi/maankurssit/MAAN6451_GISmethods

Teaching methods: Lectures and demonstrations (80% participation required), practical (80% participation required) at the UTU-LCC and self-studying

Modes of Study: Practical and portfolio (accepted), group discussions (active participation) and written exam (accepted)

Previous studies: MAAN6081 or equivalent study records (e.g. MAAN6053)

Time: II period

Evaluation: Numerical scale (0–5), with written exam 50% and portfolio 50% of the final mark

Organization responsible: Department of Geography

Person in charge: Senior assistant Niina Käyhkö, niina.kayhko@utu.fi

MAAN6452 Methods in remote sensing and image processing

Subject: Geography

Credits: 7 ECTS

Objectives: The aim of the course is that the students obtain basic theoretical and applied knowledge of the different remote sensing systems (airborne and spaceborne), data pre-processing methods, visual image interpretation techniques and numerical image processing methods. Students know remote sensing terminology and are able to use remotely sensed images for geographical analysis of earth surface features.

Content: - introduction to remote sensing with key concepts, topics and relevance in geography

- electromagnetic radiation and reflectance from the earth surfaces
- introduction to aerial photography and photogrammetry
- visual interpretation of aerial photographs
- multispectral remote sensing and remote sensing satellite systems
- image pre-processing methods

- visual image interpretation and radiometric image enhancement techniques
- spectral and spatial image processing methods
- multispectral image classification techniques

Study materials: Lecture and demonstrations notes, distributed literature, practical material (instructions and portfolio) and virtual resources via the Internet

Website: http://www.sci.utu.fi/maankurssit/MAAN6452_RSmethods

Modes of Study: Practical and portfolio (accepted), group discussions (active participation) and written exam (accepted)

Previous studies: MAAN6081 or equivalent study records

Time: IV period

Evaluation: Numerical scale (0–5), with written exam 50% and portfolio 50% of the final mark

Organization responsible: Department of Geography

Person in charge: Senior assistant Niina Käyhkö, niina.kayhko@utu.fi

Teaching methods: Lectures and demonstrations (80% participation required), practical (80% participation required) and self-studying

MAAN6453 Literature in geoinformatics

Subject: Geography

Credits: 2 ECTS

Objectives :The aim of the course is that students revise and deepen their theoretical and applied knowledge in remote sensing, Geographical Information Systems and cartography parallel with other BSc -level geography and geoinformatics studies.

Students obtain skills in the geoinformatics terminology, key methods and selected applications in the society.

Content:

- GIS functionality, spatial models, projections and coordinate systems
- digitising, editing and creating geographical information
- remote sensing
- data quality and sources of error in GIS
- vector-raster conversions, spatial data management and databases
- spatial interpolation
- GIS in decision support
- cartographic communication and visualization
- cartographic generalisation

Study materials: Jones, C. (1997). Geographical information systems and computer cartography. Longman, 319 s

Modes of Study: Written exam

Previous studies: MAAN6081 or MAAN6053 (Introduction to geoinformatics) completed. The literature exam can be used to compensate parts of these two courses (MSc in Environmental Sciences students, major in geoinformatics)

Time: Announced later

Evaluation: Numerical scale (0–5)

Organization responsible: Department of Geography

Person in charge: Senior assistant Niina Käyhkö, niina.kayhko@utu.fi

MAAN7655 Literature in applied geoinformatics

Subject: Geography

Credits: 2–8 ECTS

Objectives: The aim of the course is that students specialise in particular fields of geoinformatics in geographical research or application and obtain skills in the theoretical, methodological and applied aspects of the field.

Content: According to the specialization as agreed with the examiner

Study materials: Selected together with the examiner (e.g. books, scientific articles)
Modes of Study: Written exam
Previous studies: Methodological studies in geoinformatics (e.g. MAAN6451, 6452)
Time: Announced later
Evaluation: Numerical scale (0–5)
Organization responsible: Department of Geography
Person in charge: Senior assistant Niina Käyhkö, niina.kayhko@utu.fi

MAAN7154 MSc thesis seminar in physical geography

Subject: Geography
Credits: 1–3 ECTS
Objectives: the course aims to support the planning and writing process of the MSc thesis and provide scientific writing and discussion skills for the students.
Content: The main body of the course is formed around the presentations of the students and group discussions. All participants present their research plans and after completing the thesis present their results. Students also act as opponents for other's presentations.
Study materials: Student plans and thesis abstracts, other reading material on the course web page
Teaching methods: Seminars and self-studying
Modes of study: Seminars and practicals.
Previous studies: MSc studies in Geography ongoing and thesis under planning
Time: Announced later
Evaluation: Pass/Fail
Organization responsible: Department of Geography
Person in charge: Risto Kalliola

MAAN7351 Landscape Ecology and GIS

Subject: Geography
Credits: 6 ECTS
Objectives: The aim of the course is that students obtain skills in image processing, image interpretation and GIS techniques in the analysis of landscape and vegetation patterns and changes. Student will be able to interpret landscape and vegetation patterns from aerial photographs and satellite images and analyse landscape patterns and dynamics using GIS and field data. Students will also gain knowledge and tools for argumentation of the values and applicability of landscape information in the society, especially for land use planning and landscape conservation.
Content: - theories of landscape research and landscape ecology applied in geography
- landscape models and analysis approaches
- field work techniques in landscape research
- remote sensing, old maps and historical records as source materials in landscape studies
- GIS methods in the analysis of landscape patterns and changes
Study materials: Lecture and demonstrations notes with distributed self-study literature, practical material (instructions) and virtual resources via the Internet
Website: http://www.sci.utu.fi/maankurssit/MAAN7351_LEGISmethods
Teaching methods: Lectures and demonstrations, practical, field excursions (Finland, Sweden) and self-studying and virtual discussions
Modes of Study: Lectures and demonstrations (compulsory participation), practical and report (accepted), field excursions (compulsory participation), self-study material and virtual learning (active participation)

Previous studies: Methodological studies (both MAAN6451 and 6452) completed and basic knowledge of landscape ecology and biogeography
Time: IV period + outside teaching periods (intensive period in May or June)
Evaluation: Numerical scale (0–5) of the practical report
Organization responsible: Department of Geography
Person in charge: Senior assistant Niina Käyhkö, niina.kayhko@utu.fi

MAAN7352 Environmental management

Subject: Geography

Credits: 3 ECTS

Objectives: This course aims to give an overview of the administrative, legal, political and economic structures used in environmental planning to prevent, control and reduce the environmental problems.

Content: The focus extends from global agreements to regional (EU), national (Finnish environmental administration) and local (Regional environmental centres, municipal administration) level frameworks for environmental management. The course presents some central tools to control and regulate the economic, public and private activities with environmental risks. It focuses on the possibilities and obligations related to the work of the environmental and land use planners.

The course outline: Introductory lectures, visits to central organisations related to environmental management and workshop

Website: http://www.sci.utu.fi/maankurssit/MAAN7352_Environmental_management/

Teaching methods: Lectures, group work

Modes of Study: Study journal / learning diary, participation in classroom work and the visits

Time: IV period

Evaluation: Numerical scale (0–5)

Organization Responsible: Department of geography

Person in charge: Lecturer Sanna Mäki, sanna.maki@utu.fi

MAAN7663 GIS and society

Subject: Geography

Credits: 2–4 ECTS

Objectives: The use of spatial data, digital maps and navigation services are fast augmenting in society and pose challenges to geographical work from school teaching to scientific research. This course reflects some concurrent trends and topics in these fields and it aims to encourage students to specialize into geoinformatics. Emphasis is given to for example such topics and societal needs as Earth monitoring, spatial data infrastructure, school teaching and the design of consumer products.

Content: The precise contents of this course may vary from year to year – reflecting the concurrent state of the art.

Study materials: Some readings will be included, details to be announced in the website.

Website: http://www.sci.utu.fi/maankurssit/MAAN7663_GIS_and_Society/

Teaching methods: Lectures, exercises and seminars

Modes of Study: Compulsory participation in all student meetings; timely completion of given study tasks.

Time: II period

Evaluation: To be announced later

Organization Responsible: Department of geography

Person in charge: Professor Risto Kalliola, risto.kalliola@utu.fi

MAAN7951 MSc Thesis in Geography

Subject: Geography

Credits: 40 ECTS

Objectives: To introduce the students in practical research and academic writing.

Content: The student carries out practical research and writes the thesis on a topic agreed with the supervisor. Before the thesis can be accepted, the student must also write a maturity essay on one topic of the thesis. The maturity essay is evaluated on pass/fail –scale.

Teaching methods: Independent scientific research under guidance by the supervisor

Modes of Study: Successful completion of the thesis.

Time: I–IV periods

Evaluation: Scale approbatur–laudatur

Organization responsible: Dept. of Geography

Person in charge: Professors of Physical geography

QUATERNARY PALEOECOLOGY AND ENVIRONMENTAL CHANGE

GMAA4805 Quaternary geology

Subject: Geology

Credits: 6 ECTS

Objectives: The students will get a thorough understanding of the different Quaternary environmental and climatic changes as well the research methodology applied to track these changes.

Content: Advanced level knowledge about ice age environmental changes, paleoclimatology and methods of reconstruction of Quaternary environment. The Quaternary Period comprises the last 2.5 million years of Earth history, an interval dominated by climate fluctuations and the waxing and waning of large northern hemisphere ice sheets. This course will cover the many types of geologic evidence, from polar ice sheets to deep-sea sediments that are used to reconstruct ocean and atmospheric conditions (e.g., temperature) through the Quaternary.

Study materials: Literature: selected up-to-date publications and selected part from text books: Ehlers, 1996. Quaternary and Glacial Geology; Lowe & Walker, 1997. Reconstructing Quaternary Environment; Siebert, M.J. Ice sheets and late Quaternary environmental change. John Wiley and Sons Ltd. (2001).

Teaching methods: Independent reading of given material

Modes of Study: Written exam.

Previous studies: Glacial geology or equivalent

Time: II period

Evaluation: Numerical scale (0–5)

Organization responsible: Dept. of Geology

Person in charge: Professor Timo Saarinen, tijusa@utu.fi

GMAA4814 Glacial stratigraphy

Subject: Geology

Credits: 5 ECTS

Objectives: The aim is to teach the students to critically use primary research literature.

Content: By using primary research literature the students will prepare a Power Point presentation in which the data and central conclusions of the research paper are presented. Thereafter the field locations and key sections will be visited to make the field observations and to gather new data. In a concluding seminar the students have added this data to their presentation and show how their new data has developed or changed the original conclusions.

Teaching methods: Reading of the primary literature, construction of the PowerPoint presentation and presentation of it, visits in the field and field observations, addition of new data to the presentation, presentation of the final conclusions in a concluding seminar.

Modes of Study: Final exam. Literature: The used research literature will be decided each time separately.

Time: III–IV periods

Evaluation: Numerical scale (0–5).

Organization responsible: Dept. of Geology

Person in charge: Professor Matti Räsänen, matti.rasanen@utu.fi

GMAA4806 Physical and chemical methods of lacustrine and marine sediments

Subject: Geology

Credits: 5 ECTS

Objectives: The object of this course is to provide state-of-art summary of the major field methods, chronological techniques, and concepts used in the study of large-scale lacustrine and marine basin analysis.

Content: Coring and dating techniques, sediment logging, mineral magnetic methods, image-analysis and other physical and chemical methods used to track environmental change using lake and marine sediments. Literature: Last and Smol, 2002. Tracking environmental change using lake sediments, vol 1&2 and some selected texts.

Teaching methods: lectures 16 h, one day lake coring trip.

Modes of Study: Written exam.

Previous studies: Quaternary geology or equivalent

Time: III period

Evaluation: Numerical scale (0–5)

Organization responsible: Dept. of Geology

Person in charge: Professor Timo Saarinen, tijusa@utu.fi

GMAA4734 Environmental history: natural sciences perspective to anthropogenic influence

Subject: Geology

Credits: 4 ECTS

Objectives: The course aims to study human impact on the physical and biological environment from prehistory to present.

Content: The recommended textbook is Goudie, A. 2005: *The Human Impact on the Natural Environment*. 6th ed. Blackwell Science.

Teaching methods: Independent reading for the book exam.

Modes of Study: Successful completion of the examination

Time: I–IV periods

Evaluation: Numerical scale (0–5)

Organization responsible: Dept. of Geology

Person in charge: Professor Timo Vuorisalo, timovuo@utu.fi.

GMAA4735 Environmental archaeology

Subject: Geology

Credits: 2 ECTS

Objectives: The course aims to provide an introduction to archaeological methods and to the importance of environmental and biological data for archaeological research.

Content: The recommended textbook is Dincauze, D.F. 2000: *Environmental Archaeology. Principles and Practice*. Cambridge University Press.

Teaching methods: Independent reading for the book exam.

Modes of Study: Successful completion of the examination

Time: I–IV periods

Evaluation: Numerical scale (0–5)

Organization responsible: Dept. of Geology

Person in charge: Professor Timo Vuorisalo, timovuo@utu.fi.

GMAA4732 Quaternary environmental changes

Subject: Geology

Credits: 2 ECTS

Objectives: The aim of the course is to give the student a historical view why, how much and how the climate and the various global ecosystems have been changing during the Quaternary time.

Content: The course covers global aspects of environmental change over the last 2.6 million years. Lectures include the discovery of Glacial/interglacial cycles as recorded in geological archives (marine sediments and ice-cores), the methods used to identify these cycles and date them, and their impact on major vegetation belts. Global ecosystem processes are emphasised, so that students will appreciate the numerous feedback processes that can amplify or dampen climate forcing. Particular attention is placed on ocean circulation and its effect on the carbon cycle. One goal is to place the observed global warming of the last century into a "geoscience perspective".

Teaching methods: lectures 12 h

Modes of Study: summary report

Time: I–II periods

Evaluation: Numerical scale (0–5)

Organization responsible: Dept. of Geology

Person in charge: Professor Timo Saarinen, tijusa@utu.fi

GMAA4730 Practical image analysis in Quaternary paleolimnology

Subject: Geology

Credits: 2 ECTS

Objectives: The aim of the course is learn basic of what kind of qualitative information is possible to obtain images using computer programs. The working environment is WorkMates in this course.

Content: The student makes 5–7 practical image analysis and image processing excersices using some freeware image analysis programs such as ImageJ.

Teaching methods: 2h demonstration lecture (obligatory) and individual work: 5–7 practical computer task with 2–3 pages long reports of each task

Modes of Study: Succesful completion of individual work

Time: IV period

Evaluation: Numerical scale (0–5)

Organization responsible: Dept. of Geology

Person in charge: Professor Timo Saarinen, tijusa@utu.fi

GMAA4736 Laboratory practical works in glacial and Quaternary geology

Subject: Geology

Credits: 8 ECTS

Objectives: The objectives of the course are to learn the student to independently be able to make different analysis and interpretation of central paleoecological materials.

Content: The course includes lectures and practicals of taxonomy and identification of macrofossils, diatoms and pollens; coring lake sediment, making diatom- and pollen-preparaths, identification and plotting the results into C2-program. Literature: selected parts from: Tracking environmental change using lake sediments. Vol I–IV Kluver Academic publishers, Lappalainen, Stén & Häikiö (1978): Turvetutkimuksen maasto-opas, Laine & Vasander (2005)

Teaching methods: lectures + practicals 30–35 h, coring + laboratory work 10–15 h, self-study (identification) depending on the efficiency of student.

Modes of Study: Attending to lectures, practicals, coring, laboratory work and succesful completion of exam.

Previous studies: GEOL4614 Practicals of Geochemistry
Time: I–II(III) periods
Evaluation: Numerical scale (0–5)
Organization responsible: Dept. of Geology
Person in charge: Assistant Eila Varjo, eila.varjo@utu.fi

GMAA4722 Lake and sea sediment surveys

Subject: Geology
Credits: 7 ECTS

Objectives: The objectives of the course are to learn the student to independently be able to use different physical, geophysical and chemical methods to the study of lake and sea sediments.

Content: Practical lake and sea sediment surveys. Coring with Kullenberg device, RV Aurelia, Acoustic sounding with RV Aurelia, X-ray radiography of sediment cores, Chemical analysis (AAS).

Practical lake sediment coring course in sub-arctic environment (Finnish Lapland). Students will learn different coring techniques. During the course several different types of lakes will be cored.

Teaching methods: laboratory work, self-study depending on the efficiency of student.

Modes of Study: Successful completion of reports

Time: I–IV periods

Evaluation: Numerical scale (0–5)

Organization responsible: Dept. of Geology

Person in charge: Professor Matti Räsänen, matti.rasanen@utu.fi, Professor Timo Saarinen, tijusa@utu.fi, Assistant Eila Varjo, eila.varjo@utu.fi

GMAA4675 Thesis

Subject: Geology
Credits: 40 ECTS

Objectives: To introduce the students in practical research and academic writing.

Content: The student carries out practical field and laboratory research and writes the thesis on a topic agreed with the supervisor.

Teaching methods: Supervision in the field and laboratory and written work

Modes of Study: Successful completion of the thesis.

Time: I–IV

Evaluation: Scale approbatur–laudatur

Organization responsible: Dept. of geology

Person in charge: Professor Timo Saarinen, tijusa@utu.fi, Professor Matti Räsänen, matti.rasanen@utu.fi

TROPICAL ENVIRONMENTS AND DEVELOPMENT

EKOL3150 Tropical plant families

Subject: Ecology

Credits: 4 ECTS

Objectives: To learn to identify the ecologically and economically most important plant families in the tropics.

Content: Examination of plant morphological and chemical characteristics from photographs and fresh and dried plant specimens.

Teaching methods: Lectures, demonstrations, excursion to the Ruissalo Botanical Garden.

Modes of Study: Successful identification of plant specimens in the final exam.

Time: II period of uneven years.

Evaluation: Numerical scale (1–5)

Organization responsible: Dept. of Biology, Section of Ecology

Person in charge: Lecturer Kalle Ruokolainen, kalle.ruokolainen@utu.fi

EKOL3113 Tropical limnology

Subject: Ecology

Credits: 4–6 ECTS

Objectives: Provide basic knowledge and understanding of the special features of tropical limnology, with particular emphasis on lakes.

Content: Additional study points obtainable by reading a book for the exam: Talling J.F. & Lemoalle J. 1998. Ecological dynamics of tropical inland waters (4 ECTS).

Related seminar arranged separately. Information about possible field course on tropical limnology at Lake Tanganyika (third in sequence) will be given later.

Teaching methods: lectures and a book exam

Modes of Study: Successful completion of exam

Time: IV period, held next time in spring 2009

Evaluation: Numerical scale (0–5)

Organization responsible: Dept. of Biology, Section of Ecology

Person in charge: Professor Jouko Sarvala, jouko.sarvala@utu.fi

YMPS6002 Environment and Development

Oppiaine: Environmental Sciences

Credits: 2 ECTS

Objectives: To familiarize students with environmental issues from the perspective of developing countries.

Content: Measurement of environmental sustainability, population growth, energy issues, food production, environmental pollution, participation of developing countries in international environmental cooperation.

Teaching methods: lectures and seminars

Modes of Study: Introductory lectures, student presentations on specific topics

Evaluation: Numerical scale (0–5)

Time: II or III period

Organization responsible: Dept. of Biology, Environmental Sciences

Person in charge: Professor Timo Vuorisalo, timovuo@utu.fi

MAAN7081 Project management and seminar

Subject: Geography

Credits: 5 ECTS

Objectives: The students will learn to plan and administer projects. Special emphasis is placed on development projects. The students will know the principles of project design and evaluation and the application of different guidelines.

Content: The course will cover all steps of project document writing from problem identification to logical framework analysis.

Teaching methods: Lectures, independent work

Modes of Study: Participation in classroom work, exercise(s) and seminar

Time: period III–IV

Evaluation: Numerical scale (0–5)

Organization responsible: Department of Geography

Person in charge: Senior assistant Taimi Sitari, taimi.sitari@utu.fi

EKOL3001 Research project

Subject: Ecology

Credits: 10–15 ECTS

Objectives: To learn the different phases of a research project: formulation of research question and research plan, applying for funds, carrying out the planned observations, experiments or other activities, organizing and analyzing the results and reporting them.

Content: Participation in the activities of an ongoing research project and carrying out an own supervised subproject.

Teaching methods: Research activities according to an accepted plan.

Modes of Study: Work diary and final report.

Time: Research projects are offered for students irregularly by researchers.

Evaluation: Pass/fail

Organization responsible: Dept. of Biology, Section of Ecology

Person in charge: Lecturer Kalle Ruokolainen, kalle.ruokolainen@utu.fi

YMPS6044 Environment and Development in East Asia

Subject: Environmental Sciences

Credits: 2–6 ECTS

Objectives: Internet course which will familiarize students to environmental problems and importance of natural resources in East-Asian countries, particularly in China's societal development.

Content: Issues under discussion are cultural-ecology, history of nature, environmental policy, international cooperation and law considering environment protection.

Teaching methods: Internet course

Modes of Study: Lectures via Internet (2 ECTS), paper about the subject (2 ECTS) and exam or essay (2 ECTS). Students can also do only one part of the course.

Time: I–IV periods

Evaluation: Numerical scale (1–5)

Organization responsible: Dept. of Biology, Section of Ecology

Person in charge: Professor Timo Vuorisalo, timovuo@utu.fi

EKOL3132 Advanced Issues in Biodiversity Research

Subject: Ecology

Credits: 4 ECTS

Objectives: To familiarize students with currently topical issues in biodiversity research.

Content: Lectures and seminars on selected topics in the field.

Teaching methods: Lectures and seminars, 24h

Modes of Study: Active participation to lectures and own presentation.

Time: III period

Evaluation: Numerical scale (1–5)

Organization responsible: Dept. of Biology, Section of Ecology

Person in charge: Professor of Biodiversity Research

EKOL3141 Advanced Conservation Ecology

Subject: Ecology

Credits: 6 ECTS

Objectives: to provide advanced knowledge of tropical themes in conservation ecology. Content: Lectures and research articles on central themes in conservation ecology, such as the ecology of invasions, metapopulation ecology, restoration ecology and community viability.

Teaching methods: Lectures, essay, seminar

Modes of Study: Active participation and successful completion of the essay

Time: II period, held next time in 2008

Evaluation: Numerical scale (1–5)

Organization responsible: Dept. of Biology, Section of Ecology

Person in charge: Professor Kai Norrdahl, kai.norrdahl@utu.fi

EKOL2311 Geographical plant ecology I: Vegetation processes in arctic, alpine and arid environments

Subject: Ecology

Credits: 4 ECTS

Objectives: Gives an overview of the living conditions and the processes that modify plant communities in harsh environments.

Content: Lectures deal with abiotic factors that limit base production, and the interaction between herbivores and abiotic factors in arctic, alpine and arid environments.

Teaching methods: Lectures, 48h

Modes of Study: Active participation to lectures and successful completion of the exam

Time: II period, next time in 2008

Evaluation: Numerical scale (0–5)

Organization responsible: Dept. of Biology, Section of Ecology

Person in charge: Professor Lauri Oksanen, lauri.oksanen@utu.fi

EKOL2311 Geographical plant ecology II: Vegetation processes in forest biomes

Subject: Ecology

Credits: 4 ECTS

Objectives: To give an understanding of the conditions and the processes that modify forest vegetation and lead to differences in the species diversity of forest areas.

Content: Lectures deal with macroclimate and other abiotic factors, competition between plants, and disturbances that modify plant communities, and differences in the species diversity between forests.

Teaching methods: Lectures, 48h

Modes of Study: Active participation to lectures and successful completion of the exam

Time: III period, held next time in 2009

Evaluation: Numerical scale (0–5)

Organization responsible: Dept. of Biology, Section of Ecology

Person in charge: Professor Lauri Oksanen, lauri.oksanen@utu.fi

EKOL3004 Visitor seminar

Subject: Ecology

Credits: 2 ECTS

Objectives: The aim of this seminar series is to give a general view to current ecological theories and results of ecological research as well as international contacts between the section of Ecology and foreign research institutes.

Contents: Seminars 10–20 h

Modes of Study: seminars, presentations (active participation)

Time: I–II periods

Evaluation: Pass/fail

Organization responsible: Department of Biology, Genetics

Person in charge: Professor Erkki Korpimäki, erkki.korpimaki@utu.fi

EKOL3134 Use of GIS and Remote Sensing in Studying Biodiversity

Subject: Ecology

Credits: 2 ECTS

Objectives: Understand the ecological theory behind the use of GIS and remote sensing techniques in ecological research and obtain a critical overview of different practical and theoretical applications of these techniques.

Content: Lectures on ecological theory, student presentations of relevant research articles, guest lectures of researchers, a visit to the regional office of the national environmental administration in Turku.

Modes of Study: Attendance in lectures and the visit to the regional office, short presentation of a research article, preparation of critical comments on at least two other articles

Previous studies: Basic technical knowledge about GIS remote sensing, e.g. the course Introduction to cartography and geoinformatics, MAAN6081.

Time: IV period of even years

Evaluation: pass/fail

Organization Responsible: Department of Biology, Section of Ecology

Person in Charge: Lecturer Hanna Tuomisto, hanna.tuomisto@utu.fi

EKOL3135 Biodiversity Informatics

Subject: Ecology

Credits: 2 ECTS

Objectives: Introduction to the tools, procedures and analysis techniques developed for handling large amounts of information on species.

Content: Lectures on the use of tools and procedures provided especially by the Global Biodiversity Information Facility, informatics tools for taxonomy and systematics, and the use of museum and observational data bases in research. Practicals on species distribution modelling.

Teaching Methods: Lectures and practicals

Modes of Study: Exam and a report of the modelling exercise

Time: IV period of uneven years

Evaluation: Numerical scale (1–5)
Organization Responsible: Department of Biology, Section of Ecology
Person in Charge: Professor Timo Vuorisalo, timovuo@utu.fi and lecturer Hanna Tuomisto, hanna.tuomisto@utu.fi

EKOL3008–3009 Final examination(s)

Subject: Ecology

Credits: 10 ECTS

Objectives: To ensure the student's adequate knowledge on the literature of the field.

Content: The content of the books/articles studied is chosen together by the student and the professor in charge.

Modes of Study: Successful completion of the examination

Time: I–IV periods

Evaluation: Numerical scale (0–5)

Organization responsible: Dept. of Biology, Section of Ecology

Person in charge: Professor of Biodiversity Research

EKOL3012 Master's Thesis

Subject: Ecology

Credits: 40 ECTS

Objectives: To demonstrate that the student masters the methods and literature related to the topic of the thesis and is capable of scientific thinking and communication.

Content: To go deeply into the subject of the thesis through practice and literature.

Teaching methods: The thesis must be done according to a plan made together with and accepted by the supervisor(s).

Modes of Study: Thesis and maturity essay (*kypsyysnäyte* in Finnish)

Time: The thesis is usually done during the second year of master's studies, but the timing should be programmed together with the potential supervisor(s) and the academic supervisor who helps in making the personal study plan of the student.

Evaluation: Scale approbatur–laudatur

Organization Responsible: Department of Biology, Ecology (biodiversity research)

Person in charge: Professor Timo Vuorisalo, timovuo@utu.fi

TIMING OF THE STUDIES

This is a normative timing of the studies. It should be noted that some of the courses are held only every second year, so the timing of some courses can change from the first year to second year or vice versa.

Ecotoxicology

1st year, Fall	ECTS
Introduction to environmental sciences at UTU	2
Language studies	5
Environmental agreements and project management	2
Resources of earth	2
Conservation biology	4
Fundamentals of environmental sciences	2
Introduction to cartography and geoinformatics (continues in spring)	2
Principles in ecotoxicology	4
Seminars in toxicology (continues in spring)	
Methods in molecular and genotoxicology	
Possible optional studies	
1 st year, Spring	ECTS
Introduction to cartography and geoinformatics (continues from fall)	2
Seminars in toxicology (continues from fall)	4
Modelling and evaluating tox. data sets	6
Readings in ecology	6
Readings in Environmental physiology of animals	2
Studies in genetics	5
Census and survival analysis of vertebrate populations	
Possible optional studies	
2 nd year, Fall	
Thesis (continues in spring)	20
Final examinations (continues in spring)	12
Possible optional studies	
2 nd year, Spring	
Thesis (continues from fall)	20
Research seminar in Environmental Sciences	4
Final examinations(continues from fall)	7

Geoinformatics in Environmental research	
1st year, Fall	ECTS
Introduction to environmental sciences at UTU	2
Language studies	5
Environmental agreements and project management	2
Resources of the earth	2
Conservation biology	4
Fundamentals of environmental sciences	7
Methods in GIS	2
Literature in Geoinformatics	
Possible optional studies	
1 st year, Spring	ECTS
Literature in applied geoinformatics	2–8
Methods in remote sensing and image processing	7
Optional courses such as	
- Landscape ecology and GIS	6
- Environmental management	3
2 nd year, Fall	
Thesis (continues in spring)	20
MSc thesis seminar in physical geography (or in spring)	1–3
Optional studies such as	2
- GIS and society	
2 nd year, Spring	
Thesis (continues from fall)	20
Research seminar in Environmental Sciences	4
MSc thesis seminar in physical geography (or in fall)	1–3
Optional studies	

Quaternary Paleoecology and Environmental Change	
1st year, Fall	ECTS
Introduction to environmental sciences at UTU	2
Language studies	5
Environmental agreements and project management	2
Resources of earth	2
Conservation biology	2
Introduction to cartography and geoinformatics (continues in spring)	6
Quaternary geology	8
Laboratory. practical works in glacial and Quaternary geology	
Lake and sea sediment surveys (continues in spring/2 nd year)	
Optional studies	
1 st year, Spring	ECTS
Introduction to cartography and geoinformatics (continues from fall)	2
Glacial stratigraphy	4
Physical and chemical methods of lacustrine and marine sediments	5
Lake and sea sediment surveys	4
Fundamentals of environmental sciences	2
Environmental archaeology	2
Optional studies such as	
- Practical image analysis in Quaternary paleolimnology	
2 nd year, Fall	
Thesis (continues in spring)	20
Environmental history	4
Optional studies such as	
- Quaternary environmental changes	2
2 nd year, Spring	
Thesis (continues from fall)	20
Research seminar in Environmental Sciences	4
Optional studies	

Tropical Environments and Development	
1st year, Fall	ECTS
Introduction to environmental sciences at UTU	2
Language studies	5
Environmental agreements and project management	2
Resources of earth	2
Conservation biology	4
Fundamentals of environmental sciences (or later)	2
Introduction to cartography and geoinformatics (continues in spring)	4
Tropical plant families	2
Environment and Development (either in period II or III)	6
Optional studies such as	4
- Advanced conservation ecology	
- Geographical plant ecology I	
1 st year, Spring	ECTS
Introduction to cartography and geoinformatics (continues from fall)	2
Advanced issues in biodiversity research	4
Project management and seminar	5
Tropical limnology	4–6
Environment and Development (either in period II or III)	2
Optional studies such as	10–15
- Research project	4
- Advanced issues in Biodiversity research	4
- Geographical plant ecology II	2
- Biodiversity Informatics	
2 nd year, Fall	
Thesis (continues in spring)	20
Final examinations (continues possibly in spring)	5–10
Optional studies such as	
- Research project	10–15
2 nd year, Spring	
Thesis (continues from fall)	20
Research seminar in Environmental Sciences	4
Final examinations(continues possibly from fall)	
Optional studies such as	
- Use of GIS and Remote Sensing in Studying Biodiversity	2

CONTACT INFORMATION

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EXAM DATES 2008–2009