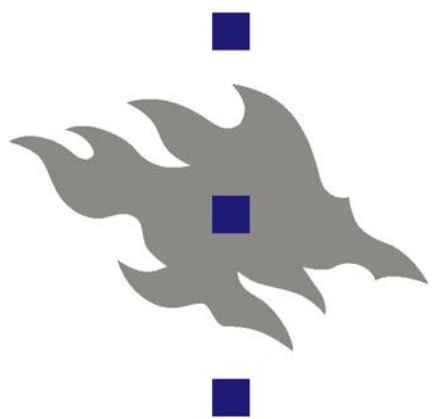


**Faculty of Agriculture and Forestry**

**Study Guide**

**2006-2007**

**2007-2008**



UNIVERSITY OF HELSINKI

## Study Guide of the Faculty of Agriculture and Forestry

The Study Guide begins with a short introduction to Finland and University of Helsinki. More detailed information can be found in the **Orientation Handbook**, which is intended for international students at the University of Helsinki. After this introduction, the Faculty of Agriculture and Forestry and all its departments are introduced in alphabetical order. Under each department, the disciplines are introduced and requirements for the Bachelor's and Master's degrees are listed. The courses offered by each department are also described. At the end of the Study Guide, regulations concerning degrees as well as postgraduate studies in the Faculty of Agriculture are given.

### Useful internet addresses:

- <http://www.helsinki.fi/english/courses>; information on courses at the University of Helsinki that are taught in English
- <http://www.helsinki.fi/weboodi>; updated information about the actual teaching events (when and where a particular course is held) as well as descriptions of all courses.
- <http://www.helsinki.fi/university>; home page of the University of Helsinki
- <http://www.helsinki.fi/mmtkd/English>; home page of the Faculty of Agriculture and Forestry
- <http://www.helsinki.fi/admissions/obh>; Orientation Handbook for international students at the University of Helsinki

# CONTENTS

FINLAND IN BRIEF	6
UNIVERSITY OF HELSINKI	7
Organisation	7
International Activities	7
Location	7
Degrees	8
Teaching Methods and Modes of Assessment	8
The Finnish Credit System and ECTS	8
Grading	8
Language of Instruction	9
Academic Calendar	9
Library Facilities	10
Language Learning Opportunities	10
Computer Facilities	11
Admission Procedures	11
Student Organisations	12
Health Care	12
Cost of Living	13
Public Transportation in the Helsinki city area	13
Visa and Residence Permit	13
FACULTY OF AGRICULTURE AND FORESTRY	14
Departments	14
Staff and Students	14
Location: Viikki Campus	14
Studies	14
NOVA	15
DEPARTMENTS AND INSTRUCTION	16
International Master's degree programmes	17
Master's Degree Programme in Biotechnology	17
Master's Degree Programme in Forest Sciences and Business	19
Master's Degree Programme in Plant Production Science	33
Helsinki Region Biotechnology Educational Programme (HEBIOT)	37
Biotechnology Minor	39
General Studies: Y courses	40
Department of Agrotechnology	44
Agricultural and Environmental Engineering	44
Department of Animal Science	48
Animal Science	48

Department of Applied Biology	55
Biology of Plant Production	55
Botany	75
Organic Food and Farming	76
Department of Applied Chemistry and Microbiology	82
Environmental Soil Science	83
Food Chemistry	86
Microbiology	90
Nutrition	93
General Chemistry	97
Department of Economics and Management	99
Agricultural Economics	100
Consumer Economics	106
Environmental Economics	109
Food Economics	114
Marketing	118
Extension Education	120
Rural Entrepreneurship	121
Department of Food Technology	122
Food Technology	122
Department of Forest Ecology	130
Forest Ecology	130
Department of Forest Economics	150
Forest Economics	150
Forest Products Marketing	158
Department of Forest Resource Management	163
Forest Resource Science and Technology	163
Forest Mensuration and Management	173
Geoinformatics	174
Logistics	177
REGULATIONS AND GUIDELINES	178
Standing Regulations Concerning Degrees in the Faculty of Agriculture and Forestry	178
Guidelines for Postgraduate Studies at the Faculty of Agriculture and Forestry	186
Government Decree on University Degrees 794/2004	196

## FINLAND IN BRIEF

Forests and lakes dominate Finland's landscape, but there is also geographical variety, ranging from the unique archipelago of the southern and western coastlines to the rolling mountains and clear-water rivers of Lapland.

The climate in Finland is milder than in many other areas of the same latitude, partly because of the warming influence of the Gulf Stream. The population of Finland is about five million. Finland is a parliamentary republic with a multiparty political system. The Parliament's 200 members are elected every four years and the head of state is the President.

Finland and Finnish national consciousness have been moulded by the country's location between East and West. Although Finns count themselves as part of Western culture, the Finnish lifestyle has undeniably been enriched by its close proximity to Russia. Finland today is, as it has always been, in close contact with both St Petersburg and Stockholm.

From the 13th century Finland was part of the kingdom of Sweden. But in 1809, after Sweden had lost a war against Russia, Finland was ceded to Russia and became an autonomous Grand Duchy within Imperial Russia, its Grand Duke being the Czar himself. After the October Revolution in Russia in 1917, Finland declared itself independent.

During World War II Finland managed to retain its independence in the Winter War and Continuation War against the Soviet Union. Since the war, it has pursued a policy of military non-alliance. Finland joined the European Union in 1995 and is among the eleven member states that adopted the common currency euro (€) in the beginning of 1999. The final transfer from national currencies to the euro occurred in January 2002.

Finnish industry has traditionally been based on forestry and the metal industry. High technology is a relative newcomer, especially telecommunications, which currently leads Finnish exports. However, less than a third of Finns work in industry, while 65% work in trade and services.

The Finnish language belongs to the Finno-Ugric group of languages - it is closely related to Estonian and remotely to Hungarian. Finland's special richness lies in its bilingualism: both Finnish and Swedish are official languages. English is currently the most popular foreign language in schools. Other languages widely studied are German, French and Russian.

### Helsinki in a Nutshell

Helsinki, the capital of Finland, is situated on the south coast of the country, on the Bay of Finland. It was founded in 1550 by King Gustav Vasa of Sweden. Fires destroyed the old wooden town many times, but it was always rebuilt. The capital was officially changed from Turku to Helsinki in 1812, and after the university was moved to the new capital in 1827, Helsinki quickly became the cultural and intellectual centre of Finland. Its harbour and location bolstered trade and made Helsinki an important city in the Baltic region. Today, Helsinki and the neighbouring cities of Espoo and Vantaa are home to a sixth of the Finnish population, or nearly a million people. The capital offers the cultural, educational and entertainment necessities of student life in beautiful natural surroundings, as the Helsinki metropolitan area is regarded as one of the greenest cityscapes in the world.

# UNIVERSITY OF HELSINKI

- the leading multidisciplinary university in Finland

P. O. Box 33 (Yliopistonkatu 4)  
FIN-00014 University of Helsinki  
Finland  
Tel: +358-9-1911 (switchboard)  
<http://www.helsinki.fi>

The University of Helsinki is the largest university in Finland with the widest range of disciplines. It is also the only Finnish university invited to membership in the League of European Research Universities, an association of the best research-intensive universities of Europe.

## Organisation

Teaching and research is carried out in eleven faculties, representing Theology, Law, Medicine, Arts, Science, Behavioural Sciences, Social Sciences, Agriculture and Forestry, Veterinary Medicine, Biosciences, and Pharmacy. The faculties are divided into departments and institutes.

The University receives the bulk of its funds from the national budget, but it also has income of its own for funding research, teaching and administration. At the present time, there are no tuition fees for students. Admission to higher education in Finland is based on the results of the annual entrance examinations and the matriculation examinations taken at the end of the upper secondary school.

## International Activities

International relations at the University of Helsinki are based both on personal contacts between members of the academic staff and on agreements between governments, universities, faculties and departments. The university has concluded bilateral agreements with approximately eighty universities and it has 350 SOCRATES/ERASMUS partner universities across Europe. Other international

programs that the University is involved with include ALFA, ISEP, LEONARDO, NORDPLUS and TEMPUS.

Academic staff participates in European research programs and international research networks. For details, please see <http://www.helsinki.fi/research/index.htm>

## Location

There are four main campus areas: the City Centre (theology, law, arts, social sciences, and behavioural sciences), Meilahti (medicine), Kumpula (science), and Viikki (biosciences, pharmacy, agriculture and forestry, and veterinary medicine). The University also maintains nine units and training centres in other parts of the country, some as far north as Lapland.

Maps of each campus area are available at the website <http://www.helsinki.fi/maps/>

### University of Helsinki in a nutshell:

- Established in Turku 1640, moved to Helsinki in 1828
- Main tasks: research, teaching and societal interaction
- Bilingual (Finnish and Swedish), tuition also provided in English
- 11 faculties and 18 independent institutes
- 38,000 degree students, 57,000 continuing education and Open University students
- 7600 employees, of whom 3700 are researchers and teachers
- 4289 degrees granted in 2005, of which 378 doctorates
- Operates on four campuses in Helsinki and 20 other locations throughout Finland
- Aims to establish its position as one of the leading multidisciplinary research universities in Europe

## Degrees

As the Bologna process is moving steadily forward in Europe, a two-cycle model for degrees went into effect at the University of Helsinki on 1 August 2005.

In this new degree system, the basic degree consists of the lower academic degree (the Bachelor's degree, 180 credits/3 years), and the higher academic degree (the Master's degree, 90-120 credits/2 years). The third cycle encompasses postgraduate studies (leading to a postgraduate degree). The postgraduate degrees are the Licentiate and the Doctoral degrees. Both require independent research and a thesis. The doctoral thesis has traditionally been published and then defended in a public debate. It should be possible to complete a Licentiate in two or three years and a Doctoral degree in four.

## Teaching Methods and Modes of Assessment

### The University System

Finnish university teaching is based on research; research is also included in university studies even at the undergraduate level. The independent nature of university studies in Finland allows for considerable freedom of choice in most fields and therefore requires student initiative and individual work. Students in most fields are usually free to decide the pace of their studies, and graduation times vary considerably. Many students also combine their studies with work, either for financial reasons or to gain work experience related to their field of study.

The teaching framework at Finnish universities is based on lecture courses with a final examination that the students are required to pass after attending the course in order to receive credit for their work. These basic courses are supplemented by seminars, small groups introducing students to independent research, as well as practical classes and various forms of written and oral assignments. Especially in the sciences, mid-term examinations are a typical form of assessment. Another common type of course is a reading course where students take

a book examination on any one of the scheduled examination dates during the academic year.

The development of teaching methods has a high priority in the University of Helsinki. New approaches to complement the traditional classroom situation are constantly being developed, and alternative modes of assessment are being introduced.

## The Finnish Credit System and ECTS

### What is ECTS?

The European Credit Transfer System (ECTS) was developed by the Commission of the European Communities in order to provide common procedures to guarantee academic recognition of studies abroad. It provides a way of measuring and comparing learning achievements, and transferring them from one university to another. This is achieved through the use of a common ECTS credit unit and a common ECTS grading scale.

### Finnish credit system

In the context of the reform of the Finnish degree structures (the Bologna process), the national credit allocation and accumulation systems have been replaced by an ECTS-based system. In the new system, the annual student workload amounts to 1600 hours. The concept of the student workload refers to the time required to achieve the set learning outcomes of a programme. A total of 60 credits (opintopiste) will measure the workload of a full-time student during one academic year; a total of 30 credits is the full-time workload for one term. Consequently, credit conversions from the ECTS system to the Finnish system or vice versa are no longer required (1 credit = 1 ECTS)

## Grading

In its meeting on 24 March 2004, the Senate of the University of Helsinki decided that as of 1 August 2005, the University shall apply a six-level grading scale of 0-5 in the grading of basic degrees. The official name of the grading scale is the General scale.



The General scale is directly comparable to the ECTS grading scale, as shown below, where the corresponding ECTS grade is given in brackets. However, there is one important difference: the ECTS system is based on an expectancy of the distribution of different grades, the Finnish system is not. That means that in the Finnish system there is no rule or expectation as to how large a proportion of the participants in any given course can be given what grade; each student is graded on his/her individual performance, not in relation to the performance of others.

**Grading scale:**

5 = excellent (A)  
4 = very good (B)  
3 = good (C)  
2 = satisfactory (D)  
1 = passable (E)  
0 = fail (F or FX)

In addition to applying this general grading system, pass/fail grading may be applied in cases of practical training and practical skills courses, as decided by the Faculty Council. Bachelor's theses, as all other studies, will be graded on the General scale. A seven-level Latin grading scale will be applied in the grading of the Master's theses (Laudatur being the highest grade): Laudatur/Eximia cum laude approbatur/Magna cum laude approbatur/Cum laude approbatur/Non sine laude approbatur/Lubenter approbatur/Approbatur

## Language of Instruction

The University of Helsinki is bilingual, with instruction and student services offered in both Finnish and Swedish. Instruction in Swedish is offered in certain degree programmes. For more information, please see the information booklet on instruction in Swedish, 'Den svenskspråkiga undervisningen', [www.helsinki.fi/svenska/shb/](http://www.helsinki.fi/svenska/shb/).

An increasing amount of instruction in English is available. Even when there is no instruction available in English, it is often possible to complete course requirements through independent study. There are also some independent Master's degree programmes in which the language of instruction is completely English. Information on courses taught in English at the University of Helsinki is available

on the website <http://www.helsinki.fi/english/courses/>. Examinations may be taken in Finnish, Swedish, or English. Taking an examination in English may require advance agreement with the teacher. Some teachers may also accept tests in other languages.

## Academic Calendar

The academic year consists of two terms (semesters). The autumn term begins officially on August 1 and lasts until December 31. The spring term begins officially on January 1 and lasts until July 31. Each term is divided into two seven-week periods (I and II in the autumn term, III and IV in the spring term). The exact period dates vary somewhat from faculty to faculty.

**Period dates in the Faculty of Agriculture and Forestry in 2006-2007 and 2007-2008.**

**Period 2006-2007**

I	September 4 - October 22
II	October 30 - December 17
III	January 15 - March 4
IV	March 12 - May 6

**2007-2008**

I	September 3 - October 21
II	October 29 - December 16
III	January 14 - March 2
IV	March 10 - May 4

The orientation course for foreign students is offered at the beginning of each term. For 2006-2007, the dates are the following: September 4-8, 2006 and January 8-12, 2007.

Although there is no summer term, most departments and libraries operate through the summer holiday period. Also, some departments arrange courses and examinations in the summer. The University of Helsinki organises a Summer School in August (see below).

There are no formal examination periods at the end of the terms; exams are given throughout the terms.

## Library Facilities

As Helsinki is the capital of Finland, it houses the country's central libraries and archives. The Library of the University of Helsinki is also the national library, which receives deposit copies of all printed matter published in Finland. In addition to the central library, faculties have their own libraries and some departments have their own departmental libraries.

The University of Helsinki also has an Undergraduate Library, including a notable collection of both fiction and scientific literature for the use of all students in the University. The Undergraduate Library has a special section for texts required for examinations; basically it is not necessary to purchase books. Waiting lists for a particular book may be long during the weeks preceding the examination date. Campus libraries provide course books for the students on their respective campuses, e.g. Viikki Science Library on the Viikki Campus.

The Undergraduate Library is part of the Aleksandria Learning Centre, a service centre for both university students and teachers at the City campus. The facilities of the Aleksandria Learning Centre include 700 study places, of which 350 have computer terminals, as well as open group work areas and workstations where students can use their own laptops or borrow laptops from the Centre.

### University Main Library

P.O. Box 15 (Unioninkatu 36)  
FIN-00014 University of Helsinki  
tel. +358-9-191 23196  
fax +358-9-191 22719  
HYK-palvelu@helsinki.fi  
<http://www.lib.helsinki.fi/english/index.htm>

### Undergraduate Library

P.O. Box 53 (Vuorikatu 7)  
FIN-00014 University of Helsinki  
tel. +358-9-191 23920  
fax +358-9-191 23931  
<http://www.opiskelijakirjasto.lib.helsinki.fi/ugl/>

### Aleksandria Learning Centre

P.O. Box 53 (Vuorikatu 7/Fabianinkatu 28; entrance through the Fabianinkatu 26 gateway)  
00014 University of Helsinki  
<http://www.opiskelijakirjasto.lib.helsinki.fi/koulutus/libtut/aleksandria.html>

## Language Learning Opportunities

**The Department of Finnish** arranges courses in Finnish for foreign students. International students registered at the university are free to take these courses, although students have to register for them in advance at the beginning of terms. Students who are already familiar with Finnish may take a minor in Finnish language and culture. The programme is offered entirely in Finnish, and students can apply for admission to the programme after they have completed the four basic Finnish courses. Passing the Finnish 1-4 courses by a placement test is also possible. For details, see the Finnish for Foreign Students webpage, address below. Courses in Swedish for Foreigners are arranged by the Language Centre.

### Department of Finnish/Finnish for Foreign Students

P. O. Box 3  
FIN-00014 University of Helsinki  
Visiting address: Fabianinkatu 33, 5th floor, room 5030.  
tel. +358-9-191 22889  
fax +358-9-191 22074  
skk-info@helsinki.fi  
<http://www.helsinki.fi/hum/skl/inenglish/culture.html>

The University of Helsinki **Language Centre** provides language instruction to students from all eleven faculties. The major emphasis of the teaching programme is on the degree requirements of the faculties. Additionally, the Centre offers a large number of voluntary courses in several other languages. The facilities also include a self-access language laboratory. In addition to courses at the Language Centre, the courses of the departments of less widely taught languages are usually open to all interested students.

### Language Centre

P.O. Box 4 (Fabianinkatu 26)  
FIN-00014 University of Helsinki  
tel. +358-9-191 22690  
fax +358-9-191 24224  
<http://www.helsinki.fi/kksc/english/index.html>

## Computer Facilities

All students are given access to the University's computer network. This includes a personal e-mail account, as well as access to word processing, the Internet, and other applications. The computers are mostly personal computers, including some Macintosh computers, and the network can be accessed from home by modem. Computer facilities exist on all the campuses. Applications for access codes are processed through the faculty or the department. You can also contact the personnel in the different computer facility locations. For contact information and details on the computer facilities, see [www.helsinki.fi/atk/english/](http://www.helsinki.fi/atk/english/).

## Admission Procedures

### Exchange Students

Exchange students participating in programmes should contact the co-ordinator at their home university first. If nominated for a period of study at the University of Helsinki, they will receive further information and an application form from the University's International Services. Deadlines for submitting the application form are: May 15 for the autumn term and November 1 for the spring term. Late applications will not be considered.

The application forms are available on-line at the address <http://www.helsinki.fi/exchange/>. The forms have to be completed and sent in on-line within the deadlines given above.

### For more information, please contact:

International Student Services/Student Mobility Services  
P.O. Box 3 (Fabianinkatu 33)  
FIN-00014 University of Helsinki  
FINLAND  
fax +358-9-191 22176

e-mail: [studentexchange@helsinki.fi](mailto:studentexchange@helsinki.fi)  
<http://www.helsinki.fi/exchange/>

### Visiting students

Visiting students not participating in an exchange programme may send an application directly to the faculty concerned. Application forms and information are available from the Admissions website <http://www.helsinki.fi/admissions/>. Some faculties have deadlines for visiting students' applications.

### Degree students

Foreign students who wish to complete a degree at the University of Helsinki should send the electronic application (available from <http://www.helsinki.fi/admissions/>) by January 31. The deadline applies to undergraduate and graduate students (up to the Master's degree), and in some faculties also to postgraduate students. Many faculties have entrance examinations. For more information, see the Admissions website.

### International Admissions Services

P. O. Box 3 (Fabianinkatu 33)  
FI-00014 University of Helsinki  
Finland  
e-mail: [admissions@helsinki.fi](mailto:admissions@helsinki.fi)  
<http://www.helsinki.fi/admissions/index.htm>

### Registration

A Finnish student from the local Erasmus Student Network (ESN) will meet **exchange students** upon arrival, if they have notified International Student Services of their exact time of arrival. This is done with a special form available in the "Welcome Guide" sent to admitted students. Students are advised to arrive during the week preceding the start of classes (see the Academic Calendar, page 9) in order to register, settle accommodation matters and apply for a residence permit. There is also an orientation programme for foreign students, which includes useful information and tutoring. Some social activities will be arranged. The orientation programme dates are also given in the Academic Calendar.

**Degree students** and **visiting students** outside the exchange programmes also register through the international co-ordinators of the faculties. Degree students and visiting students are required to pay the Student Union membership

University of Helsinki

fee (67 € for the whole academic year and 34.50 € for one term; rates as of 2005 – 2006, minor changes possible) before registration.

### **Accommodation**

More information can be found in the Orientation Handbook ([www.helsinki.fi/admissions/obh/](http://www.helsinki.fi/admissions/obh/)).

For exchange students, housing is arranged by the International Services.

Visiting students not participating in an exchange programme and degree students may apply directly to the Helsinki Region Student Housing Foundation (HOAS) after receiving confirmation of acceptance. Applications can only be submitted electronically through the HOAS website [www.hoas.fi](http://www.hoas.fi)

## **Student Organisations**

### **Student Union**

The Student Union of the University of Helsinki (HYY) was founded in 1868. It has more than 30,000 members, which makes HYY the biggest of all student unions in Finland. Every basic degree student enrolled at the University of Helsinki automatically becomes a member of HYY. The basic purpose of HYY is to represent the members and to improve their study and social conditions. Over 200 organisations are within the compass of the Student Union.

HYY provides its members with a number of services, such as health care, student housing, low-cost meals and legal advice. The student card entitles the holder to a number of discounts in public transportation, theatres, concerts, opera and certain shops. Different organisations within HYY can apply for financial aid, conference rooms, independent transport and other services.

#### **For further information please contact:**

International Secretary of the Student Union (tel. +358-9-13114 219, [international@hyy.helsinki.fi](mailto:international@hyy.helsinki.fi)).

The Central Office of HYY, services for members  
New Student House  
Mannerheimintie 5 A, 2nd floor  
FIN-00100 Helsinki

tel. +358-9-1311 4211

fax +358-9-1311 4216

e-mail: [international@hyy.helsinki.fi](mailto:international@hyy.helsinki.fi)

[www.helsinki.fi/hyy/en/](http://www.helsinki.fi/hyy/en/)

### **Erasmus Student Network (ESN)**

The ESN has a special counselling office in the Main Building at the start of every term when international students arrive. The Finnish students in the network act as mentors for international students, giving guidance and help with everyday problems. ESN also organises a pub night once a week, parties, trips, and other similar events.

#### **ESN-University of Helsinki**

Address and telephone the same as the Student Union's

[esn-helsinki@helsinki.fi](mailto:esn-helsinki@helsinki.fi)

[www.helsinki.fi/hyy/esn/](http://www.helsinki.fi/hyy/esn/)

### **“Nations” and Other Organisations**

Nations (osakunnat in Finnish) have traditionally been student associations for students coming from the same region in Finland. This tradition still continues, but foreign students are also welcome as members. Most faculties and departments have their own student organisations.

## **Health Care**

Health care services are provided by the Finnish Student Health Service FSHS for the members of the Student Union. The services include appointments with general practitioners, dentist, other specialists and nurses, as well as laboratory and X-ray examinations. Small fees (a few euros) are charged for some services. Hospital treatment or emergency duty services are not provided.

Students from the EU are advised to bring E111 or E128 forms from their home country in order to ensure the additional benefits of national health care services, if, for example, hospital treatment is needed. Students from outside the EU are advised to obtain private travel insurance to provide additional coverage. Students who are not eligible for Student Union membership should provide health care coverage for themselves.

**Finnish Student Health Services FSHS  
(YTHS in Finnish)**  
Töölönkatu 37 A  
FIN-00260 Helsinki  
tel. +358-9-405 051  
fax +358-9-4050 701  
[www.yths.fi](http://www.yths.fi)

## Cost of Living

University higher education is funded by the State through the Ministry of Education. Consequently, students enrolled in regular degree programmes or exchange students do not pay tuition fees. Students only have to pay for their study-related materials, plus their accommodation and living expenses. The total monthly living expenses of a single student average around 700 – 800 €, including accommodation, provided the student lives in a student flat.

The Student Union membership fee (67 €) is obligatory. However, exchange students have their fee paid by the International Student Services. The membership fee includes a health-care contribution that entitles students to inexpensive health-care services. Student Union cardholders are also entitled to subsidised student meals. Other discounts in various stores are also available to students upon presentation of the card.

## Student meals

Student meals are served at UniCafe restaurants, which are owned by the Student Union. There are numerous student cafés and restaurants in all the different University locations around the city. The restaurants typically offer three kinds of lunches, all of which include bread and salad. Prices range from 2.00 € to 5.00 €. For more information, see <http://unicafe.fi/>.

## Public transportation in the Helsinki city area

Helsinki boasts a very efficient transportation system. There are four different forms of public transportation: underground (the metro), local trains, buses and trams. The same tickets can be used on all four. Further information is available at: <http://www.hkl.fi/english.html>.

Information on public transport in the Helsinki region (Espoo, Vantaa, Kauniainen) is available at <http://www.ytv.fi/eng>

## Visa and Residence Permit

An address list of the Finnish embassies abroad is available at the website of the Ministry for Foreign Affairs: <http://www.formin.fi/english/>

For more information, see the Orientation Handbook, <http://www.helsinki.fi/admissions/obh>

## FACULTY OF AGRICULTURE AND FORESTRY

Faculty office  
P.O. Box 62 (Viikinkaari 11)  
FIN-00014 University of Helsinki  
Finland  
Fax +358 9 191 58 575  
[www.helsinki.fi/mmtk/english/](http://www.helsinki.fi/mmtk/english/)

The Faculty of Agriculture and Forestry at the University of Helsinki is responsible for academic, research-based instruction in the biological, technological, and economic sciences of its own fields: agricultural sciences, nutrition and food sciences, forestry sciences, and environmental sciences. The sustainable use of natural resources forms the value basis for the teaching and research at the Faculty.

### Departments

The Faculty is divided into the following nine departments, which cover all the major areas of academic education and research in the fields of the Faculty:

Agrotechnology  
Animal Science  
Applied Biology  
Applied Chemistry and Microbiology  
Economics and Management  
Food Technology  
Forest Ecology  
Forest Economics  
Forest Resources Management

In addition to these departments, the Faculty of Agriculture and Forestry maintains two experimental farms; Hyytiälä Forest Station near Tampere and the subarctic Värriö Research Station in northern Finland.

### Staff and Students

The Faculty of Agriculture and Forestry has

- Nearly 600 staff persons. About 190 of them are teaching personnel: professors, lecturers, and assistants.
- Approximately 3000 students. About 2500 students are completing their Master's degree

and about 500 are postgraduate students (doctoral students).

- Approximately 100 international students, most of whom are completing their Master's or Doctorate degree.
- Annually about 50 international exchange students.

### Location: Viikki Campus

The departments of the Faculty of Agriculture and Forestry are located on the Viikki Campus, one of the four campus areas of Helsinki University. The Viikki Campus is about 10 km northeast of downtown Helsinki and, with its Biosciences Centres, is one of the largest science parks in Europe. The Faculties of Biosciences, Pharmacy, and Veterinary Medicine are also located on the Viikki Campus. Furthermore, the campus offers facilities for biotechnology enterprises for the efficient, practical application of the most recent scientific knowledge.

### The Viikki Science Library

The Viikki Science Library ensures that students, teachers, and researchers in the scientific community on the campus receive the up-to-date information they need. The nine subject fields of the Viikki Science Library are agriculture, biosciences and biotechnology, ecology, systematics and environmental science, food science, forestry, home economics and consumer research, pharmacy and economics, social sciences, and veterinary medicine. The collections and services of the library are available to everyone. The library offers in-class teaching for groups and personal tutoring on information retrieval in English. For further information, see <http://www.tiedekirjasto.helsinki.fi/english/>.

### Studies

#### Degrees of the Faculty

The Faculty of Agriculture and Forestry offers the Bachelor's and Master's degrees in Food Sciences (elintarviketieteiden kandidaatti,

ETK; elintarviketieteiden maisteri, ETM) and in Agriculture and Forestry (maatalous- ja metsätieteiden kandidaatti, MMK; maatalous- ja metsätieteiden maisteri, MMM). Qualified students may be accepted directly for studies leading to the Master's degree. Postgraduate degrees include the Licentiate and Doctorate in Food Sciences or in Agriculture and Forestry.

#### **Majors offered by the Faculty of Agriculture and Forestry**

Agricultural and Environmental Engineering<sup>1</sup>  
Agricultural Economics<sup>1</sup>  
Animal Science<sup>1</sup>  
Biotechnology  
Biology of Plant Production<sup>1</sup>  
Consumer Economics  
Environmental Economics  
Food Chemistry  
Food Economics  
Food Technology<sup>1</sup>  
Forest Ecology  
Forest Economics<sup>1</sup>  
Forest Resource Science and Technology<sup>1</sup>  
Forest Products Marketing  
Marketing  
Microbiology  
Nutrition  
Soil and Environmental Science

<sup>1</sup>These major subjects are further divided into **specialisation lines**. If a major has specialisation lines, a student chooses one of them and completes his/her studies according to the degree requirements of that line.

Some major subjects contain several different **fields of research and teaching** (e.g. nine in Forest Ecology). In these cases, students may direct their studies towards these according to their interest.

#### **Degree requirements**

The Bachelor's degree (180 credits) consists of major subject studies (basic and intermediate studies, including a thesis and a written maturity essay), minor subject studies, and general studies including language studies, information and communication technology studies, a personal study plan, and practical training.

The Master's degree (120 credits) consists of advanced studies in the major subject (including a

thesis of 40 credits and a written maturity essay), a personal study plan, and practical training.

#### **Language of instruction**

In the Faculty of Agriculture and Forestry, the Bachelor's degree can be completed only in Finnish or in Swedish. The Master's degree can, in most cases, be completed also in English.

### **Postgraduate studies**

Students who have completed their Master's degree can be accepted as postgraduate students. Some of the postgraduate students in the Faculty are members of Graduate Schools, which offer specific postgraduate studies in particular areas. Other postgraduate students complete their study requirements by participating in courses offered mainly by the departments of the Faculty. Postgraduate students are required to complete 60 study credits and a doctoral dissertation in order to complete a doctorate, or 60 study credits and a Licentiate thesis in order to complete the Licentiate degree. Students make a postgraduate study plan, which is processed by the Committee for Research and Postgraduate Education and approved by the dean. Research required for the doctorate or licentiate degree is conducted in one of the research groups or more independently either in the Faculty or in a research institution. Full-time students should be able to complete their doctorate in four years.

### **NOVA**

The Faculty of Agriculture and Forestry is a member of the Nordic Forestry, Veterinary and Agricultural University (NOVA) network. The Faculty of Agriculture and Forestry works in close cooperation with its Nordic counterparts. In 1995, the Nordic agricultural and veterinary universities signed an agreement and established NOVA, the Nordic Forestry, Veterinary and Agricultural University. The general aim of NOVA is to increase the range and raise the quality of education and research through various cooperation projects. NOVA also has close contacts with corresponding universities in the Baltic countries.

## DEPARTMENTS AND INSTRUCTION

In this part of the Study Guide you can find introductions of the departments of the Faculty, requirements for the Bachelor's and Master's degrees in different majors, and course descriptions of courses offered in English or Finnish.

*Since the Study Guide is valid for two years, only general information on the course timetables is given here. The dates and places (teaching events) for each course can be found from:*

1. WebOodi, [www.helsinki.fi/weboodi/](http://www.helsinki.fi/weboodi/)
2. the organising department (bulletin board and [www-pages](http://www-pages))
3. [www.helsinki.fi/english/courses](http://www.helsinki.fi/english/courses)

**WebOodi** is an internet based tool for students for accessing Oodi, an information system used by several Universities in Finland. With WebOodi you can e.g. search descriptions and teaching events of courses, register for courses, order transcripts and register for terms in the University.

### Abbreviations used in the names of courses indicate the responsible department:

**Agrotechnology:** AGTEK, MMTEK, YFYS

**Animal Science:** KEL, KEJAL, KRAV, KEBIOT

**Applied Biology:** KTB, AEKO, JAL, KVIL, RIKKA, KPAT, MPAT, MAEL, MEHI, PTARH, KASV, LUOMU, KBIOT

**Applied Chemistry and Microbiology:** MMKEM, EK, MIKRO, RAV, YKEM, BKEM, YBIOT, MAA

**Economics and Management:** MMTAL, COOP, EE, KE, MAE, MAL, MPOL, MARK, YE, NEUVO, MY

**Food Technology:** ETT

**Forest Ecology:** ME

**Forest Economics:** MMEKN, FEC, FECP, FECM, FPM

**Forest Resources Management:** MMVAR, MARV, METEK, PTEK, MSUU, GIS, LOG

In addition, Y courses are common courses, intended for all interested students in the Faculty,

BIOT courses are biotechnology courses organized jointly by several departments, and FOR courses are courses organized jointly by the three Forest departments.

### Glossary of degree studies

(adapted to the practices and programmes of the Faculty of Agriculture and Forestry)

**Basic studies** (perusopinnot): Studies that give basic level knowledge and skills of the discipline.

**Intermediate studies** (aineopinnot): The main problems, theories, and methods of the discipline.

**Advanced studies** (syventävät opinnot): In-depth studies of the discipline, including independent research and the Master's thesis.

**General studies** (yleisopinnot): Methodological studies, studies supporting the major

**Language studies and information and communication technology (ICT):** Language studies, computer skills, communication studies.

**Other studies:** This category may contain a wide variety of studies, often including studies in another discipline that are not understood as 'general studies'.

**Free-choice studies:** University level studies freely chosen by the student

**Elective studies:** All categories (except free-choice studies) can also include elective studies. Contrary to free-choice studies, selection of courses in elective studies is more restricted and must be approved by the department.

**Minor subject studies** (sivuaineopinnot): Basic (or basic and intermediate) studies of a discipline different from student's own major.

**Major subject studies** (pääaineopinnot): Studies of the discipline in which the Master's thesis is written. Major subject studies are basic and intermediate studies (in the Bachelor's degree), and advanced studies (in the Master's degree).

**Study unit** (opintojakso): e.g. a lecture course or a laboratory course.

**Study entity** (opintokokonaisuus): A larger entity consisting of several study units. E. g. 'basic studies' is a study entity. NB! Terms 'study unit', 'study module', 'study block' are used in an inconsistent way in the University.



## INTERNATIONAL MASTER'S DEGREE PROGRAMMES

### Master's Degree Programme in Biotechnology

The International and interdisciplinary Master's Degree Programme in Biotechnology was initiated in 2005 by the University of Helsinki, the Helsinki University of Technology and the Helsinki School of Economics. In the University of Helsinki, the Faculties of Biosciences and Agriculture and Forestry together with the Institute of Biotechnology and the Neuroscience Center, are the main organizers of the teaching in this Master's Degree Programme.

#### Studies in the Master's Degree Programme in Biotechnology

In the master courses the students will specialize to one of the five fields of biotechnology, which in the University of Helsinki are Bioinformatics and Systems Biology, Biotechnology of Natural Resources, Neurobiotechnology, Cellular Biotechnology and Structural Biology, and Health and Pharmaceutical Biotechnology. The studies in the Master's Degree Programme contain advanced practical courses in biotechnology, courses in economics, and final examinations. A central part of advanced studies is the Master's thesis, which alone is worth 40 credits. Students admitted to the Master's Degree Programme may be obligated to complete their knowledge in biotechnology with one year studies (at the most 60 credits). So students are able to finish their Master of Science degree in biotechnology in 2-3 years.

#### Bioinformatics and Systems Biology

Bioinformatics and Systems Biology are closely linked to each other. Bioinformatics applies mathematical, statistical and computing methods that aim to solve biological problems using DNA and amino acid sequences and related information. Systems biology is an approach to studying complex biological systems made possible through technological breakthroughs such as the human genome project. Unlike traditional biology that examines single genes

or proteins in isolation, systems biology simultaneously studies the complex interaction of many levels of biological information to understand how they interact.

#### Biotechnology of Natural Resources

Biotechnology of Natural Resources is a broad and diverse field that offers an opportunity to specialize for example in food, plant, animal, forest, microbial or environmental biotechnology. Food and microbial biotechnology have applications in the production of a variety of microbes, their enzymes and bioactive compounds. Plant and forest biotechnology, enabled by genome studies, provide new tools for plant breeding and production of novel products in plants. Animal and agricultural biotechnology have applications in nutrition and breeding of domestic animals. The target areas for environmental biotechnology can be pollution diagnostics, products for pollution prevention and bioremediation. In addition it offers solutions and tools for the production of energy and fuels from renewable resources.

#### Neurobiotechnology

The studies in the neurobiotechnology track are organized by the Neuroscience Center (NC) in collaboration with faculties. Neuroscience studies and research are directed to the molecular biology and the cell biology of the nervous system, developmental neuroscience, and basic research of diseases of the nervous system.

#### Cellular Biotechnology and Structural Biology

Cellular Biotechnology refers to the utilization of microbial, animal and plant cells. Structural Biology solves the chemical function and three dimensional mechanisms of macromolecules and macromolecular complexes. The Institute of Biotechnology is heavily involved in the education in this track. Within the areas of

## International Master's Degree Programmes

their expertise, the Institute is responsible for providing essentially all the courses and training, as well as supervision of the M.Sc. theses according to a study plan approved by the faculties.

### Health and Pharmaceutical Biotechnology

The important areas of the Health and Pharmaceutical Biotechnology are bio-informatics and the genome research of human, drug designing and development of new diagnostic methods as well as development of functional food.

### How to apply

The application deadline is January 31<sup>st</sup> annually.

Special prerequisites for the Master's Degree Programme in Biotechnology are a completed Bachelor's degree or equivalent in the field of biosciences and a certificate of the knowledge of English language. For more information, see <http://www.helsinki.fi/admissions/>.

### Contact Persons

**Niklander-Teeri, Viola**, Coordinator, B-bldg, Room K111, tel. 191 58424, [viola.niklander-teeri@helsinki.fi](mailto:viola.niklander-teeri@helsinki.fi)

#### Faculty of Agriculture and Forestry:

**Hatakka, Annele**, Head of HEBIOT at the Faculty of Agriculture and Forestry, Biocenter 1, Room 3210, tel. 191 59314, [annele.hatakka@helsinki.fi](mailto:annele.hatakka@helsinki.fi)

#### Faculty of Biosciences:

**Saari-Lahti, Hannu**, Head of HEBIOT in the Faculty of Biosciences, Biocenter 2, Room 6025, tel. 191 59107, [hannu.saari-lahti@helsinki.fi](mailto:hannu.saari-lahti@helsinki.fi)

#### Helsinki Region Biotechnology Educational Program (HEBIOT):

**Kaappinen, Leila**, HEBIOT Coordinator, Biocenter 2, Room 4007, tel. 191 59088, [leila.kaappinen@helsinki.fi](mailto:leila.kaappinen@helsinki.fi)

### Further information

<http://www.helsinki.fi/biotech>

## Curriculum

### Degree Requirements 2006-2008

#### Master's Degree Programme in Biotechnology

##### GENERAL STUDIES, 12 CREDITS

529229 Business Economics, 8 cr  
529208 Ethics, 3 cr  
529242 Personal Study Plan for Achieving the Master's Degree, 1 cr

##### MAJOR STUDIES, 80-99 CREDITS

###### Obligatory advanced studies, 51-53 cr

882503 Final examination for the M.Sc. degree, 8-10 cr  
882504 Master's Thesis and Maturity Essay, 40 cr  
529249 Advanced Seminar in Biotechnology, 3 cr

###### Alternative studies according to the specialisation track, 30-47 cr

At least 20 credits from the following courses:  
882505 Practical Training, max 10 cr  
529212 Advanced Training in a research group, I and II, 8 + 8 cr and/or practical courses.

Other elective studies, at least 10 cr

##### LANGUAGE STUDIES AND STUDIES IN INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)

1 cr of ICT studies is integrated in 529249 Advanced Seminar in Biotechnology

##### FREE-CHOICE STUDIES, 8-27 CREDITS

#### Advanced courses in English according to the specialisation track

<http://www.helsinki.fi/biotech/>

# Master's Degree Programme in Forest Sciences and Business

## General Information

The Master's Degree Programme in Forest Sciences and Business aims to promote the sustainable use of forest resources and human well-being through education based on scientific research. The programme is designed for qualified students who want to become experts in sustainable forestry and work in an innovative, cross-cultural environment. All teaching is arranged in English.

The Programme is organized by the Departments of Forest Ecology, Forest Economics, Forest Resource Management, and Applied Biology. Four major subjects are offered: *Forest Ecology*, *Forest Resource Science and Technology*, *Forest Economics*, and *Forest Products Marketing*.

Specialized studies are offered in two options: 1) Science-based specialized studies consisting of theoretical and methodological studies in one's major subject; or 2) Theme-based multidisciplinary specialized studies in one of the following two modules: 'Sustainable Forest Resource Management' and 'Global Forest Enterprises'.

## Degree Structure

The Programme consists of general studies (15 credits), major subject studies (70 credits), other studies (science-based specialized studies or theme-based, multidisciplinary specialized studies, 25 credits), and electives (10 credits) totalling 120 credits. The estimated duration of studies is two years.

## Admission to the Programme

The programme is open to students holding a Bachelor's degree (or the equivalent) in forest sciences, ecology, economics, social sciences, technology, or natural resources related sciences. Prospective students with a B.Sc. in forestry are primarily considered for admission to the programme. Additionally, holders of a Bachelor's degree in other fields who also have a sufficient forestry background (*i.e.* work experience) are encouraged to apply. Proof of proficiency in the English language is required. The application deadline is January 31<sup>st</sup> annually. For further details, please see <http://www.helsinki.fi/mscfc> and <http://www.helsinki.fi/admissions>

## Careers

The Master's Degree Programme in Forest Sciences and Business will equip you with the professional skills necessary to work in the increasingly challenging and global forestry field, both in Finland and abroad. In the wake of climate change and increased pressures to exploit forests, societies everywhere are in great need of professionals who are able to provide guidance in the wise use of forest resources now and in the future.

The University of Helsinki has a long tradition in forest sciences since 1908. There are approximately 70 M.Sc. graduates annually. Graduates of the programme will find professional opportunities in forestry (and natural resources) and the forest industry, within governmental and non-governmental organizations as well as in scientific research. Employment opportunities are available worldwide.

### Contact Persons

**Pearson, Meeri**, planning officer/student adviser, B-bldg., room 520, tel. 191 57976, meeri.pearson@helsinki.fi

Department of Forest Ecology:

**Huuskonen, Saija**, student adviser, B-bldg., room 217, tel. 191 58112, saija.huuskonen@helsinki.fi

Department of Forest Economics:

**Rekola, Mika**, university lecturer, B-bldg., room 516, tel. 191 57972, mika.rekola@helsinki.fi

Department of Forest Resource Management:

**Talvitie, Mervi**, student adviser/researcher, B-bldg., room 333, tel. 191 58165, mervi.talvitie@helsinki.fi

### Registration for Courses and Examinations

Students register for courses and general examinations primarily through Web-Oodi (<http://www.helsinki.fi/weboodi>). Examinations held on the last day of a given course do not require preregistration.

### Registration of Study Attainments

Department of Forest Ecology: **Heliara, Varpu**, departmental secretary, B-bldg., room 218, tel. 191 58113, varpu.heliara@helsinki.fi

Department of Forest Economics: **Juoperi, Sinikka**, office secretary, B-bldg., room 533, tel. 191 57987, sinikka.juoperi@helsinki.fi

Department of Forest Resource Management: **Toivonen, Katriina**, office secretary, B-bldg., room 411, tel. 191 58175, katriina.a.toivonen@helsinki.fi

### Further Information

<http://www.helsinki.fi/mscfb>

## Curriculum

### Degree Requirements 2006-2008

Listed according to major subject.

#### Master's Degree Programme in Forest Sciences and Business (MScFB) FOREST ECOLOGY

MASTER'S DEGREE, 120 credits		credits	timing (yr./period)
<b>GENERAL STUDIES, 15 credits</b>			
FOR520	Introduction to Studies in Forest Sciences and Business	3	1/I
MKV314	Interpersonal Communication in Intercultural Context	3	1/I
MMVAR31	Project Planning and Management	5	1/III
ME400	Personal Study Plan	1	1/III
	ICT Driving Licence (information technology skills)	3	1/I

#### MAJOR SUBJECT STUDIES, 70 credits

##### Advanced Studies, 70 credits

ME402	Special Practical Training	3	open
ME403	Essays	3	1-2/I-IV
FOR530	Master's Thesis Seminar	5	1/II-IV – 2/I-II
ME500	Master's Thesis	40	2
	Maturity Essay		

#### One of the following specialization lines (A, B, or C):

##### *A) Tropical Silviculture*

ME450	Seminar: Agriculture and Forestry in Developing Countries	3	1/III
ME451	Field Course: Tropical Forest Ecology and Silviculture	5	1-2/January
ME452	Special Topics on Silviculture in Developing Countries	3	1-2/II
ME454	Agroforestry in the Tropics and Developing Countries	5	1/IV
ME458	Advanced Literature: Tropical Silviculture	5	1-2/ open

##### *B) Boreal Forest and Peatland Ecology*

ME222	Structure, Dynamics and Biodiversity of Boreal Forests	3	1/II
ME405	Sustainable Forestry	3	1/II
ME413	Biogeochemistry of Boreal Forest Ecosystems and Soils	5	1/III
ME341	Ecology of Peatlands	3	1-2/I

## International Master's Degree Programmes

		credits	timing (yr./period)
<u>One of the following (literature):</u>			
ME441	Special Literature 1: Peatland Ecology	5	1-2/open
And ME442	Special Literature 2: Peatland Ecology	3	1-2/open
ME411	Forest Soil Science Literature Review and Evaluation	6	1-2/open
ME422	Advanced Literature: Silviculture	5	1-2/open
ME433	Advanced Literature: Ecology of Forest Trees	6	1-2/open

### C) Forest Tree Breeding

JAL505	Forest Tree Breeding	5	1-2/I
JAL401	Selection Breeding and Experimental Designs	5	1-2/III
JAL502	Advanced Literature: Plant and Forest Tree Breeding	10	1

### OTHER STUDIES, 25 credits

Supportive studies based on the student's personal study plan. To be approved by the professor in charge.

The student chooses between either *science-based specialized studies* or *theme-based, multidisciplinary specialized studies*. In science-based specialized studies, students strengthen their scientific knowledge and skills in forest ecology, with emphasis on their chosen specialization line: tropical silviculture, boreal forest and peatland ecology, or forest tree breeding. In theme-based, multidisciplinary studies, students broaden their knowledge of ecological, economical, social, and technical aspects of the forest sector.

#### **Science-based Specialized Studies in Forest Ecology. 25 credits:**

##### *Specialization lines A and B:*

ME407	Field Course on Methods in Forest Ecology	4	1-2/summer
-------	---	---	------------

Additionally, the student selects courses from the following list to fulfil the 25 credit requirement (Note: other courses may be accepted):

ME401	Special Project	3-8	1-2/open
ME414	Forest Soil Hydrology and Water Balance	5	1-2/IV
ME424	Introduction to Models of Growth and Yield Dynamics	4	1-2/III
ME431	Methodology of Forest Tree Ecology	8	1-2/IV
ME446	Carbon and Nutrient Dynamics in Peatland Ecosystems	5	1-2/summer
ME455	Workshop: National Forest Programmes	5	1-2/III
ME457	Participatory Methods in Sustainable Management of Natural Resources	5	1-2/I
ME351	Tropical Forest Ecology and Silviculture	3	1-2/III
ME310	Soil Formation and Classification	5	1-2/I
ME311	Näytteenotto metsämaasta sekä maan ja kasvimateriaalin kemiallisten ja fysikaalisten ominaisuuksien mittaaminen/ Forest Soil Sampling and Analysis of Soil Physical and Chemical Properties	5	1-2/I

		credits	timing (yr./period)
ME343	Literature: Mires of the World	2	1-2/open
ME443	Turvegeologia ja –teknologia/Peat Geology and Technology	3	1-2/IV
ME444	Turpeen käyttö Suomessa – tavoitteet ja ristiriidat / The Use of Peat in Finland – Matching the Goals and the Conflicts	3	1-2/IV
ME345	Literature: Forest Management on Peatlands	3	1-2/open
ME475	Forest Protection and Wildlife	5	1-2/IV
ME504	Pohjois-Suomen kurssi / Field Course on Forestry in Northern Finland	3	1-2/late Aug., early Sept.
ME462	Tropical Forest Pathology	3	1-2/open
ME460	Epidemiology and Ecology of Plant Pathogens	5	1-2/IV
ME560	Plant-microbe Interactions and Molecular Defence of Plants	10	1-2/II

*Specialization line C:*

JAL504	Breeding of Agricultural and Horticultural Crop Plants	5	1-2/I
JAL402	Conservation of Plant Genetic Resources	5	1-2/IV
JAL403	Molecular Methods in Plant Breeding	5	1-2/I
KBIOT300	Plant Biotechnology and Molecular Biology	5	1-2/III
KBIOT301	Laboratory Course in Plant Biotechnology	5	1-2/IV
KBIOT401	Laboratory Course in Plant Molecular Biology	5	1-2/III

**Theme-based, Multidisciplinary Specialized Studies, 25 credits:**

List of courses, see after curricula, page 28

**ELECTIVES, 10 credits**

Based on the student's personal study plan. To be approved by the professor in charge. Language studies (i.e. Finnish offered by the Department of Finnish Language and Literature, or Swedish offered by the Language Centre) and Statistical Data Processing (Y136) are recommended.

<b>MASTER'S DEGREE TOTAL</b>	<b>120</b>
------------------------------	------------

**Master's Degree Programme in Forest Sciences and Business (MScFB)  
FOREST ECONOMICS**

<b>MASTER'S DEGREE, 120 credits</b>		<b>credits</b>	<b>timing (yr./period)</b>
<b>GENERAL STUDIES, 15 credits</b>			
FOR520	Introduction to Studies in Forest Sciences and Business	3	1/I
MKV314	Interpersonal Communication in Intercultural Context	3	1/I
MMVAR31	Project Planning and Management	5	1/III
FEC201	Personal Study Plan	1	1/I
	ICT Driving Licence (information technology skills)	3	1/I
<b>MAJOR SUBJECT STUDIES, 70 credits</b>			
<b><u>Advanced Studies, 70 credits</u></b>			
FEC210	Advanced Forest Economics	4	1/I
FECM210	Quantitative Methods in Forest Resource Management	5	1-2/IV
FEC210	Econometrics II	6	1/II
Or FEC220	Introduction to Methods of Social Sciences	6	1/I-II
FECM280	Essays	3	2/open
Or FEC280	Essays	3	2/open
FECM270	Literature	5	1-2/open
Or FEC270	Literature	5	1-2/open
FEC270	Special Practical Training	2	open
FOR530	Master's Thesis Seminar	5	1/II-IV – 2/I-II
FECM290/ FEC290	Master's Thesis	40	2
	Maturity Essay		
<b>OTHER STUDIES, 25 credits</b>			

Supportive studies based on the student's personal study plan. To be approved by the professor in charge.

The student chooses between either *science-based specialized studies* or *theme-based, multidisciplinary specialized studies*. In science-based specialized studies, students strengthen their scientific knowledge and skills in forest economics. In theme-based, multidisciplinary specialized studies, students broaden their knowledge of ecological, economical, social, and technical aspects of the forest sector



		credits	timing (yr./period)
<b><u>Science-based Specialized Studies in Forest Economics, 25 credits:</u></b>			
The student selects from the following courses to fulfil the 25 credit requirement (Note: courses from other departments, faculties, or universities can also be approved):			
FECM220	Economics of the Timber Industry	5	1-2/IV
FECP230	Forest Policy Analysis	6	1-2/III-IV
FECP271	Private Forestry and Forest Policy	3	1-2/III
FECP250	Valuation of Environmental Benefits	3	1-2/I
FECP240	International Forest Policy	3	open
FECP260	Special Topics in Forest Economics and Policy	3-7	open
Or FECM260	Special Topics in Forest Economics and Management	3-7	open
LOG1	Basics of Logistics	3	1/II
ME455	National Forest Programmes	5	1-2/III
<b><u>Theme-based, Multidisciplinary Specialized Studies, 25 credits:</u></b>			
List of courses, see after curricula, page 28			
<b>ELECTIVES, 10 credits</b>			
Based on the student's personal study plan. To be approved by the professor in charge. Language studies (i.e. Finnish offered by the Department of Finnish Language and Literature, or Swedish offered by the Language Centre) and Statistical Data Processing (Y136) are recommended.			
<b>MASTER'S DEGREE TOTAL</b>		<b>120</b>	

**Master's Degree Programme in Forest Sciences and Business (MScFB)  
FOREST PRODUCTS MARKETING**

<b>MASTER'S DEGREE, 120 credits</b>		<b>credits</b>	<b>timing (yr./period)</b>
<b>GENERAL STUDIES, 15 credits</b>			
FOR520	Introduction to Studies in Forest Sciences and Business	3	1/I
MKV314	Interpersonal Communication in Intercultural Context	3	1/I
MMVAR31	Project Planning and Management	5	1/III
FPM64	Personal Study Plan	1	1/I
	ICT Driving Licence (information technology skills)	3	1/I
<b>MAJOR SUBJECT STUDIES, 70 credits</b>			
<b><u>Advanced Studies, 70 credits</u></b>			
FPM7	Structures and Functions of Forest Products Marketing	9	1/III
FPM25	Strategic Planning of Forest Products Marketing	5	1/II-III
FPM26	Marketing Planning and Research (Survey Research)	6	1/I-II
FPM18	Master's Thesis Seminar	5	1/I-IV
FPM19	Articles	3	1/open
FPM21b	Special Practical Training	3	open
FPM20	Master's Thesis	40	2
	Maturity Essay		

**OTHER STUDIES, 25 credits**

Supportive studies based on the student's personal study plan. To be approved by the professor in charge.

The student chooses between either *science-based specialized studies* or *theme-based, multidisciplinary specialized studies*. In science-based specialized studies, students strengthen their scientific knowledge and skills in forest products marketing. In theme-based, multidisciplinary specialized studies, students broaden their knowledge of ecological, economical, social, and technical aspects of the forest sector

**Science-based Specialized Studies in Forest Products Marketing, 25 credits:**

For example:

FPM3	Marketing of Roundwood and Forestry Services	5	1/III
FPM17	FPM -seminar	5	2/I-III
FPM27	Advanced Literature	6	1-2/open

(Note: Other courses offered by the Department of Forest Economics, or by other faculties or universities can also be approved.)

	credits	timing (yr./period)
<b><u>Theme-based, Multidisciplinary Specialized Studies, 25 credits:</u></b>		
List of courses, see after curricula, page 28		
<b>ELECTIVES, 10 credits</b>		
Based on the student's personal study plan. To be approved by the professor in charge. Language studies (i.e. Finnish offered by the Department of Finnish Language and Literature, or Swedish offered by the Language Centre) and Statistical Data Processing (Y136) are recommended.		
<b>MASTER'S DEGREE TOTAL</b>	<b>120</b>	

## Master's Degree Programme in Forest Sciences and Business (MScFB) FOREST RESOURCE SCIENCE AND TECHNOLOGY

<b>MASTER'S DEGREE, 120 credits</b>		credits	timing (yr./period)
<b>GENERAL STUDIES, 15 credits</b>			
FOR520	Introduction to Studies in Forest Sciences and Business	3	1/I
MKV314	Interpersonal Communication in Intercultural Context	3	1/I
MMVAR31	Project Planning and Management	5	1/III
MMVAR36	Personal Study Plan	1	1/I
	ICT Driving Licence (information technology skills)	3	1/I
<b>MAJOR SUBJECT STUDIES, 70 credits</b>			
<b><u>Advanced Studies, 70 credits</u></b>			
MMVAR35	Special Practical Training	3	open
MMVAR21	Essays	3	1-2/1-4
FOR530	Master's Thesis Seminar	5	1/II-IV – 2/I-II
MMVAR32	Research Workshop	5	1-2/I-IV
MMVAR33	Master's Thesis	40	2
	Maturity Essay		
One of the following:			
MSUU11	Literature: Forest Planning	6	1-2/open
MINV11	Literature: Forest Inventory	6	1-2/open
METEK38	Literature: Forest Technology	6	1-2/open
PTEK7	Literature: Wood Technology	6	1-2/open

## International Master's Degree Programmes

		credits	timing (yr./period)
8 credits from one of the following specialization lines (A or B):			
<i>A) Forest Planning and Forest Inventory</i>			
MINV12	Advanced Studies in Remote Sensing	5	1-2/III
MARV5/1	Multi-attribute Forest Planning	6	1-2/I
MARV5/2	Decision Support Systems	3	1-2/3-4
MSUU14	Operational Methods in Forestry Planning	4	1-2/I
GIS13	GIS in Logistics and Business	5	1-2/I-II
GIS14	Environmental GIS	5	1-2/3-4
GIS15	Application Development and Applied Web GIS	5	1-2/III-IV
<i>B) Forest and Wood Technology</i>			
LOG1	Basics of Logistics	3	1/II
METEK24	International Wood Procurement	3	1-2/I-II
METEK36	Operations Research in Wood Procurement	8	2/I-II
METEK40	International Field Trip	2	1-2/III-IV
METEK41	Current Topics in Forest Technology	3	1/III
PTEK41	Current Topics in Wood Technology	3	1/III
GIS13	GIS in Logistics and Business	5	1-2/I-II

### OTHER STUDIES, 25 credits

Supportive studies based on the student's personal study plan. To be approved by the professor in charge.

The student chooses between either *science-based specialized studies* or *theme-based, multidisciplinary specialized studies*. In science-based specialized studies, students strengthen their scientific knowledge and skills in forest planning and inventory or forest and wood technology. In theme-based, multidisciplinary specialized studies, students broaden their knowledge of ecological, economical, social, and technical aspects of the forest sector.

### **Science-based Specialized Studies in Forest Resource Science and Technology. 25 credits:**

Student selects from the following courses to fulfil the 25 credit requirement (Note: courses from other faculties or universities can also be approved):

GIS4	Principles in GIS	4	1-2/III-IV
GIS13	GIS in Logistics and Business	5	1-2/I-II
GIS14	Environmental GIS	5	1-2/III-IV
GIS15	Application Development and Applied Web GIS	5	1-2/III-IV
MARV5/1	Multi-attribute Forest Planning	6	1-2/II
MARV5/2	Decision Support Systems	3	1-2/III-IV
LOG1	Basics of Logistics	3	1-2/II
LOG2	Advanced Supply Chain Management	6	1-2/I-II
MMVAR37	Basic Course in Programming	3	1-2/III

Forest Sciences and Business

		credits	timing (yr./period)
Y132C-H	Statistical Models	3	open
MINV12	Advanced Studies in Remote Sensing	5	1-2/III
MSUU14	Operational Methods in Forestry Planning	4	1-2/II
METEK16	The Environmental Effects of Wood Utilization, Wood Procurement and Silvicultural Practices	3	1-2/IV
METEK24	International Wood Procurement	3	1-2/I-II
METEK36	Operations Research in Wood Procurement	8	2/I-IV
METEK40	International Field Trip	2	1-2/III-IV
METEK41	Current Topics in Forest Technology	3	1/III
PTEK41	Current Topics in Wood Technology	3	1/III

Courses in Systems Analysis Laboratory and in the Department of Forest Products Technology at the Helsinki University of Technology (HUT).

Courses in statistics and geoinformatics at the Faculty of Science.

Optimization and business mathematics at the Helsinki School of Economics.

**Theme-based, Multidisciplinary Specialized Studies, 25 credits:**

List of courses, see after curricula, page 28

**ELECTIVES, 10 credits**

Based on the student's personal study plan. To be approved by the professor in charge. Language studies (i.e. Finnish offered by the Department of Finnish Language and Literature, or Swedish offered by the Language Centre) and Statistical Data Processing (Y136) are recommended.

<b>MASTER'S DEGREE TOTAL</b>	<b>120</b>
------------------------------	------------

## THEME-BASED, MULTIDICIPLINARY SPECIALIZED STUDIES (25 CREDITS)

Students choose between one of two themes: Sustainable Forest Resource Management (SFRM) or Global Forest Enterprises (GFE). The student must plan with his/her professor which courses he/she will take. The courses listed below are only examples, and other courses can be accepted (also from other faculties and universities), depending on the prior knowledge of the student.

		credits	timing (yr./period)
<b>Theme I: Sustainable Forest Resource Management (SFRM)</b>			
FOR540	Group Investigation	5	2/IV
<i>A minimum of 5 credits from each of the following blocks (A-C) for a combined total of 20 credits:</i>			
<b><u>A Ecology</u></b>			
For example:			
ME351	Tropical Forest Ecology and Silviculture	3	1-2/III
ME310	Soil Formation and Classification	5	1-2/I
ME413	Biogeochemistry of Boreal Forest Ecosystems and Soils	5	1-2/III
ME457	Participatory Methods in Sustainable Management of Natural Resources	5	1-2/I
ME405	Sustainable Forestry	3	1-2/II
ME475	Forest Protection and Wildlife	5	1-2/IV
<b><u>B Resource and Technology</u></b>			
For example:			
METEK16	The Environmental Effects of Wood Utilization, Wood Procurement and Silvicultural Practices	3	1-2/IV
GIS4	Principles in GIS	4	1-2/III-IV
GIS14	Environmental GIS	5	1-2/III-IV
MINV12	Advanced Studies in Remote Sensing	5	1-2/III
MARV5/1	Multi-attribute Forest Planning	6	1-2/II
MARV5/2	Decision Support Systems	3	1-2/III-IV
<b><u>C Economics and Marketing</u></b>			
For example:			
FECP250	Valuation of Environmental Benefits	3	1-2/I
FECP220	Introduction to Methods of Social Sciences	5	1-2/I-II
FECP240	International Forest Policy	3	open
FECP210	Quantitative Methods in Forest Resource Management	5	1-2/IV
FECP270	Literature	5	open
FECP271	Private Forestry and Forest Policy	3	1-2/III
<b>Theme II: Global Forest Enterprises (GFE)</b>			
FOR540	Group Investigation	5	2/I-IV

		credits	timing (yr./period)
<i>A minimum of 5 credits from each of the following blocks (A-C) for a combined total of 20 credits:</i>			
<b><u>A Ecology</u></b>			
For example:			
ME455	National Forest Programmes	5	1-2/III
ME457	Participatory Methods in Sustainable Management of Natural Resources	5	1-2/I
ME454	Agroforestry in the Tropics and Developing Countries	5	1-2/IV
ME310	Soil Formation and Classification	5	1-2/I
ME405	Sustainable Forestry	3	1-2/II
<b><u>B Resource and Technology</u></b>			
For example:			
PTEK41	Current Topics in Wood Technology	3	1-2/III
LOG1	Basics of Logistics	3	1-2/II
METEK24	International Wood Procurement	3	1-2/I-II
METEK40	International Field Trip	2	1-2/III-IV
<b><u>C Economics and marketing</u></b>			
For example:			
FECM220	Economics of the Timber Industry	5	1-2/IV
FPM7	Structures and Functions of Forest Products Marketing	9	1-2/III

### Courses and Instruction:

Specific information on courses offered by the Departments is found separately after each departmental presentation in the study guide. Please see Web-Oodi at <http://www.helsinki.fi/weboodi> for updated course information (time, place, etc.). **Please be aware that some courses are only offered every second year (in even or odd years)**; check the course listing for further details under Courses and Instruction of the department concerned in the study guide or Web-Oodi.

The following departmental abbreviations are commonly used: MMEKO (Department of Forest Ecology), MMEKN (Department of

Forest Economics), MMVAR (Department of Forest Resource Management), SBL (Department of Applied Biology). Course abbreviations used include FOR (courses jointly arranged by the forestry departments), ME (Forest Ecology), JAL (Forest Tree Breeding), KBIOT (Plant Biotechnology), FECM (Forest Economics and Management), FECP (Forest Economics and Policy), FPM (Forest Products Marketing), MMVAR (Forest Resource Science and Technology), PTEK (Wood Technology), METEK (Forest Technology), LOG (Logistics), MSUU (Forest Planning), MINV (Forest Inventory), MARV (Forest Mensuration), GIS (Geoinformatics), MKV (Multicultural Communication), Y (general studies).

## Courses in English

### Teaching events in WebOodi

#### Introduction to Studies in Forest Sciences and Business (FOR520) 3 credits

837025

**Timing:** Master's Degree Programme studies, 1st year, period I, annually.

**Responsible person:** Meeri Pearson

**Relations to other study units:** An introductory course to studies in the Master's Degree Programme in Forest Sciences and Business. Compulsory for students of the Programme.

**Objective:** To familiarize students with studies in the Master's Programme and the organizing departments. To give students a general understanding of the ecological, economical, social and cultural aspects of present-day forestry in Finland.

**Contents:** Students are introduced to studies in their major subject and other study-related matters (student counseling, personal study plan, etc.). Lectures and a 3-day field trip covering topics related to the Finnish forestry sector, i.e. forest industry, boreal forest ecology, peatland utilization and restoration, forest ownership, nature conservation, family forestry, forest-related culture.

**Realisation and working methods:** lectures 45, group work 10, independent study 25 hours

**Study materials and literature:** Handouts

**Evaluation:** Participation, field trip report, course feedback

#### Master's Thesis Seminar (FOR530) 5 credits

837026

**Timing:** Master's Degree Programme studies, Part 1: 1st year, periods II-IV, Part 2: 2nd year, periods I-II.

**Responsible person:** University Lecturer Mike Starr (and Master's Programme student adviser)

**Objective:** The seminar prepares students for making their Master's thesis and guides them through the process.

**Contents:** The course consists of two parts: 1) Planning and organizing the study: introductory lectures and preparation of individual research plans, 2) Preparing the oral report: oral presentations by students of the material, methods and results of the study. When the thesis is completed the results are presented in the seminar. The first part should be taken before, and the second part following the

collection of research data.

**Realisation and working methods:** lectures 60, group work 10, independent study 60 hours

**Evaluation:** Presentation of research plan and results, active participation in the seminar.

#### Group Investigation (FOR540) 5 credits

837027

**Timing:** Master's Degree Programme studies, 2nd year, Periods I-IV.

**Responsible person:** Master's Programme coordinator/ student adviser

**Relations to other study units:** Compulsory for Master's Programme students intending to complete theme-based, multidisciplinary specialized studies (25 ECTS).

**Contents:** Introduction to the group investigation process: aim, group formation, literature, meetings, presentation and reporting. The group investigation delves into one of two themes: Sustainable Forest Resource Management or Global Forest Enterprises.



## Master's Degree Programme in Plant Production Science

The Master's Degree Programme in Plant Production Science aims to provide students with an understanding of the principles of sustainable plant production and the knowledge necessary to develop plant production on scientific bases. Studies are based on a personal study plan. You may choose your studies from a wide range of course options, from molecular biology to systems ecology. All teaching is arranged in English.

The Master's Degree Programme in Plant Production Science offers five specialisation lines under the major subject Biology of Plant Production: Agroecology, Crop Science, Horticulture, Plant Breeding, and Plant Pathology. You also have an opportunity to specialise in Plant Virology within Plant Pathology.

The programme consists of general studies (20 credits), major subject studies (70 credits including Master's Thesis 40 credits), elective studies related to the chosen specialisation line (25 credits), and free choice studies (5 credits). The estimated duration of studies is two years.

**The Master's Degree Programme in Plant Production Science will start in autumn term 2007. The application deadline is January 31<sup>st</sup> yearly. For further details, please see <http://www.helsinki.fi/mscpps> and <http://www.helsinki.fi/admissions>.**

### Further information

**Thurman, Tarja**, A-bldg, room 303, tel. 191 58381, [tarja.thurman@helsinki.fi](mailto:tarja.thurman@helsinki.fi). Department of Applied Biology.

## Curriculum

### Degree Requirements 2007-2008

#### Master's Degree Programme in Plant Production Science (MScPPS)

<b>MASTER'S DEGREE, 120 credits</b>		<b>credits</b>	<b>timing (yr./period)</b>
<b>GENERAL STUDIES, 20 credits</b>			
KTB410	Introduction to Studies in Plant Production Biology	3	1/I
KTB411	Personal Study Plan	1	1/I
Y155	Bioethics	3	1/II
Y131A	Statistical Models	5	1/III
KTB402	Research Methodology in the Science of Plant Production	5	1/II
	ICT-Driving Licence (information technology s,kills)	3	1/I

International Master's Degree Programmes

		credits	timing (yr./period)
<b>MAJOR SUBJECT STUDIES, 70 credits</b>			
<b><u>Advanced studies, 70 credits</u></b>			
KTB301	Special Practical Training	3	1-2/summer
KTB501	Seminars in Plant Production Biology	2	1/II-IV - 2/I-IV
	Master's Thesis	40	2
	Maturity Essay		
In addition, 25 credits of advanced studies listed below or other courses when there are reasonable grounds must be chosen within the specialisation line (Agroecology, Crop Science, Horticulture, Plant Breeding, and Plant Pathology) and approved by the professor of that line.			
<u>Agroecology</u>			
AEKO301	Ecology of Food Systems	3	2/III
AEKO403	Agroecosystem and Agrobiodiversity	5	1/II
AEKO501	Sustainability in Agri-Food Systems	10	1-2/IV
AEKO502	Literature in Agroecology	7	1-2/open
<u>Crop Science</u>			
KTB401	Physiology of Growth, Development and Yield Formation	5	1/III-IV
KTB403	Stress Physiology	5	1/II
KVIL303	Quality of Field Crops	5	2/I
PTARH402	Photobiology	5	1-2/IV
KVIL502	Literature in Crop Science	5	1-2/open
<u>Horticulture</u>			
KTB401	Physiology of Growth, Development and Yield Formation	5	1/III-IV
KTB403	Stress Physiology	5	1/II
PTARH402	Photobiology	5	1-2/IV
PTARH303	Postharvest Physiology and Technology	5	1-2/II
PTARH502	Literature in Horticulture	5	1-2/open
<u>Plant Breeding</u>			
JAL402	Conservation of Plant Genetic Resources	5	1-2/IV
KBIOT300	Plant Biotechnology and Molecular Biology	5	1/III
JAL403	Molecular Methods in Applied Plant Genetics	5	2/I
JAL502	Literature in Plant Breeding	10	1-2/open

		credits	timing (yr./period)
<u>Plant Pathology</u>			
KPAT401	Epidemiology and Ecology of Plant Pathogens	5	1-2/IV
KPAT501	Plant-Microbe Interactions and Molecular Defence in Plants	10	2/II
KPAT 400	Special Studies in Plant Pathology	5	1-2/I-IV
KPAT502	Literature in Plant Pathology	5	1-2/open

*Specialisation in Plant Virology:*

KPAT400	Special Studies in Virology	5	1-2/I-IV
KPAT403	Bacteria, Viruses and Pathogen Diagnostics: Viruses and Virus Diagnostics	5	1-2/IV

**ELECTIVE STUDIES, 25 credits**

Theoretical, methodological or multidisciplinary studies related to the specialisation line. Courses from other faculties and universities can also be approved. Studies are based on personal study plan approved by the professor.

For example, in addition to the major subject courses of other specialisation lines within the Master's Degree Programme in Plant Production Science, studies may include the following courses:

**Agricultural Zoology**

MAEL402	Biological Control of Insects, Pests and Weeds	3	1-2/IV
MEHI301	Bees, Beekeeping and Pollination	8	1-2/IV

**Agroecology**

NOVA courses in the Norwegian University of Life Sciences			
AEKO 401	Intermediate Agroecology and Farming systems	15	1-2/I
AEKO402	Advanced Agroecology and Food Systems	15	1-2/II

*Organic Agri-Food Systems Studies in Ruralia Institute, Mikkeli*

LUOMU3	Basic Literature on Organic Farming and Foodstuffs	1-6	1-2/open
LUOMU4	Practical Work	3	1/ summer
LUOMU5	Organic Quality	8	1-2/I
LUOMU6	Organic Food Systems	8	1-2/III
LUOMU7	Case Study	8	1-2/IV
LUOMU8	Literature for Subject Studies in Organic Farming and Foodstuffs	3-9	1-2/open

**Crop Science and Horticulture**

PTARH403	Horticulture for Human Well-being	5	2/III
RIKKA502	Literature in Weed Science	3	1-2/ open

International Master's Degree Programmes

		credits	timing (yr./period)
<b><u>Environmental Soil Science</u></b>			
Soil-related aspects of crop quality 22 credits			
MAA540	Plant Nutrition and Crop Quality	2	1-2/I
MAA360	Laboratory Practical	10	1-2/III
MAA370	Readings in Soil Science	10	1-2/open
<b><u>Plant Breeding</u></b>			
JAL504	Breeding of Agricultural and Horticultural Plants	5	1-2/I
JAL401	Selection Breeding and Experimental Designs	5	1-2/III
JAL505	Forest Tree Breeding	5	1-2/I
KBIOT301	Laboratory Course in Plant Biotechnology	5	1-2/IV
KBIOT401	Laboratory Course in Plant Molecular Biology	5	1-2/III
<b>FREE CHOICE STUDIES, 5 credits</b>			
University courses chosen freely by a student.			
<b>MASTER'S DEGREE TOTAL</b>		<b>120</b>	

## HELSINKI REGION BIOTECHNOLOGY EDUCATIONAL PROGRAMME (HEBIOT)

In 2004, the University of Helsinki, the Helsinki University of Technology and the Helsinki School of Economics started a new interdisciplinary educational programme in biotechnology. In the University of Helsinki, the Faculties of Biosciences, Agriculture and Forestry, Pharmacy, and Science, and the Institute of Biotechnology and the Neuroscience Center participate in this programme.

In the fall of 2004 and 2005, 27 biotechnology students in the University of Helsinki (+ 5 in the Helsinki University of Technology) started their M.Sc. studies in this programme. In parallel, 12 (2004) + 16 (2005) students at the B.Sc. (or equivalent) level were selected to start studies in the separate Master's Degree Programme in Biotechnology. These students will receive their M.Sc. diplomas from the Faculty of Biosciences and the Faculty of Agriculture and Forestry, which also share the major responsibility for the B.Sc. studies and parts of the major subject studies in the M.Sc. level.

Basic studies in biotechnology include courses in chemistry, mathematics, biochemistry, microbiology, molecular biology, bioinformatics, and biobusiness. In the study programmes leading to the Master's degree, students will specialize in one of the six tracks of biotechnology: Bioinformatics and Systems Biology, Biotechnology of Natural Resources, Neurobiotechnology, Bioprocessing (in HUT), Cellular Biotechnology and Structural Biology, and Health and Pharmaceutical Biotechnology. For more information see <http://www.helsinki.fi/biotech>.

### Contact person

**Kauppinen, Leila**, HEBIOT Coordinator,  
Biocenter 2, Room 4007, tel. 191 59088, leila.kauppinen@helsinki.fi

### REQUIREMENTS FOR THE BACHELOR'S DEGREE, 180 CREDITS

#### GENERAL STUDIES, 15-16 CREDITS

- 55395 Introduction to Chemistry, 3 cr  
590171 Organic Chemistry for Biochemists and Pharmacists (M.Sc.) I, 3 cr  
590172 Organic Chemistry for Biochemists and Pharmacists (M.Sc.) II, 3 cr or YKEM100 Chemistry Lectures, 8 cr  
YFYS1 Physics I, 5 cr or 52264 Biophysics, 3 cr + Exercises in Physics, 2 cr  
529216 Personal Study Plan, 1 cr

#### MAJOR STUDIES, 96-98 CREDITS

##### Basic studies, 25 cr

- 529201 Introduction to Biotechnology Studies, 2 cr  
529001 Basics of Biosciences 1, 7 cr  
529002 Basics of Biosciences 2, 7 cr  
BIOT100 Biotechnology I – From Basic Research to Applications, 2 cr  
52736 Gene Technology, 3 cr  
MIKRO200 Basic Course in Microbiology, 5 cr or 52818 Introduction to Microbial Biotechnology and Physiology 4 cr + an essay, 1 cr

##### Intermediate studies, 71-73 cr

- 529203 Laboratory Course in Microbiology and Microbial Genetics, 3 cr or MIKRO220 Basic Laboratory Course in Microbiology, 5 cr  
529204 Practical Course in Gene Technology, 5 cr  
52739 Genetic Bioinformatics, 2 cr  
52097 Cell Physiology, 3 cr  
529214 Practical Course in Bioinformatics, 5 cr  
BIOT300 Biotechnology II – From Inventions to Commercialization, 3 cr  
882500 Practical Training, 6 cr  
882501 Final Examination in B.Sc. Degree, 8 cr  
882502 B.Sc. Thesis and Maturity Essay, 6 cr

## Helsinki Region Biotechnology Educational Programme

529219 Bachelor's Seminar, 3 cr

8 credits from the following:

510012 Molecular Cell Biology, 5 cr

or BKEM300 Molecular Cell Biology, 5 cr

52912 Genomes, 3 cr

52949 Molecular Genetics, 5 cr

Taught at the Helsinki School of Economics:

529228 Basics of Business Economics, 8 cr

Taught at the Helsinki University of Technology:

529238 Bioprocess Engineering I, 5 cr

529239 Chemical Engineering I, 5 cr

529240 Exercise Course in Bioprocess Design, 5 cr

### LANGUAGE STUDIES AND STUDIES IN INFORMATION AND COMMUNICATION TECHNOLOGY (ICT), 14 CREDITS

Second domestic language, 4 cr

Foreign languages, 3 cr

ICT driving licence, 3 cr

### OTHER STUDIES, 7-13 CREDITS

Elective studies according to the Personal Study Plan, 7-13 cr

The following courses are recommended (4-13 cr):

#### Alternative 1: Programming and Algorithm

581325 Introduction to Programming, 5 cr

581326 Programming in Java, 4 cr

58160 Programming Project, 4 cr

#### Alternative 2: Data Management

581325 Introduction to Programming, 5 cr

581328 Introduction to Databases, 4 cr

582203 Database Application, 4 cr

### MINOR STUDIES, 50 CREDITS

882507 Basic studies in Methodological Sciences, 25 cr

Optional courses in mathematics, statistics and computer science. Courses selected from the course list of the methodological sciences ("kurssikori") offered by the Faculty of Science. The basic studies should include at least one course in mathematics and statistics.

882511 HEBIOT Basic studies in Biochemistry, 25 cr

51072 Biomolecules, 5 cr

529202 Basic Laboratory Course in Biochemistry and Chemistry, 3 cr

529205 Laboratory Course in Biochemistry, 9 cr

Elective studies of biochemistry or biotechnology, 8 cr

## REQUIREMENTS FOR THE MASTER'S DEGREE, 120 CREDITS

### GENERAL STUDIES, 12 CREDITS

529229 Business Economics, 8 cr

529208 Ethics, 3 cr

529242 Personal Study Plan for Achieving Master's Degree, 1 cr

### MAJOR STUDIES, 80-99 CREDITS

Obligatory advanced studies, 51-53 cr

882503 Final examination in M.Sc. degree, 8-10 cr

882504 Master's Thesis and Maturity Essay, 40 cr

529249 Advanced Seminar in Biotechnology, 3 cr

Alternative studies according to the specialisation track, 30-47 cr

At least 20 credits from the following courses:

882505 Practical Training, max 10 cr

529212 Advanced Training in a Research Group, I and II, 8 + 8 cr and/or practical courses.

Other elective studies, at least 10 cr

### LANGUAGE STUDIES AND STUDIES IN INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)

1 cr of ICT studies is integrated in 529249 Advanced Seminar in Biotechnology

### FREE-CHOICE STUDIES, 8-27 CREDITS

## Courses in English

See <http://www.helsinki.fi/biotech/>

## BIOTECHNOLOGY MINOR

### Biotechnology minor (25 credits)

Code: 850009

Obligatory prerequisites

Basics of Biochemistry (theory and laboratory practicals)

Basics of Microbiology (theory and laboratory practicals)

Basics of Genetics

#### A. Obligatory studies, 10 cr

BIOT100 Biotechnology I - From Basic Research to Applications, 2 cr

BIOT200 Basics of Gene Technology, 2 cr

BIOT201 Gene Technology Laboratory Course, 3 cr

BIOT300 Biotechnology II - From Inventions to Commercialization, 3 cr

#### B. Elective studies, 15 cr

You can find examples of some elective courses at [www.mm.helsinki.fi/biotekniikka/english/minor.htm](http://www.mm.helsinki.fi/biotekniikka/english/minor.htm), or you can choose other biotechnology-related courses found in HEBIOT, as well as other appropriate courses offered on the Viikki Campus or even by other universities. The four professors of the Biotechnology Major Board are responsible for approval of the elective studies. Please contact the secretary of the Board with your list of suggestions for the elective courses.

#### Contact persons

**Hatakka, Annele**, Professor, Head of the Biotechnology major, Biocenter 1, Room 3210, tel. 191 59314, [annele.hatakka@helsinki.fi](mailto:annele.hatakka@helsinki.fi)

**Niklander-Teeri, Viola**, Student Adviser, B-bldg, Room K111, tel. 191 58424, [viola.niklander-teeri@helsinki.fi](mailto:viola.niklander-teeri@helsinki.fi)

#### Courses in English

##### Teaching events in WebOodi

#### Biotechnology I -From Basic Research to Applications (BIOT100) 2 credits

85058

**Timing:** Spring term, period III

**Contents:** The lecturers describe the background of their own research field and present applications based on their own basic research. Students prepare a learning diary on some of the lecture topics.

**Other information:** The language of instruction is Finnish, but the course can be taken as a literature examination in English

#### Basic Course in Gene Technology (BIOT200) 2 credits

850011

##### Literature :

Suominen Ilari, Ollikka Pauli (-1) *Yhdistelmä-DNA-tekniikan perusteet*

Horton, R. H., Moran, L. A., Scrimgeour K. G., Perry, M. D., Rawn J. D. (2006) *Principles of biochemistry*

**Objective:** An introduction to nucleic acids and to biological information flow. The underlying theory and the various procedures of gene cloning, DNA sequencing, hybridization, and PCR methods. Applications, ethics and laws related to gene technology are treated briefly.

**Other information:** The language of instruction is Finnish, but the course can be taken as a literature examination in English.

#### Laboratory Course In Gene Technology (BIOT201) 3 credits

850012

**Objective:** Amplification of DNA by PCR, the various steps of gene cloning, purification and electrophoretic analysis of DNA.

**Other information:** Instruction of one group is arranged in English.

#### Biotechnology II -From Inventions to Commercialization (BIOT300) 3 credits

85059

**Timing:** Autumn term, period I

**Contents:** Topics related to innovations, patenting, licensing, technology transfer from laboratories to companies, patent databases, legislation and the founding of start-up companies. Students prepare a learning diary on some of the lecture topics.

**Other information:** The language of instruction is Finnish, but the course can be taken as a literature examination in English.

## GENERAL STUDIES: Y COURSES

Y courses are common courses, intended for all interested students in the Faculty. These courses are organized by different departments of the Faculty. The language of instruction is mainly Finnish, but some courses can be completed in English as well.

### Courses in English Teaching events in WebOodi

#### **Bioethics (Y155) 3 credits** 812092

**Timing:** Participation is suggested during the first year of Master's studies (autumn). Compulsory registration via WebOodi.

**Responsible person:** Co-ordinator of the ESGEMO research programme, Department of Applied Biology, Faculty of Agriculture and Forestry.

**Objective:** The aim is to familiarize students with ELSA (Ethical, Legal and Social Aspects) of biological sciences.

**Contents:** The course is composed of two times two days of lectures. These two sets of lectures are separated by a period when students participate in a WebCT discussion forum on different subjects. Lectures will provide basic information on ethical principles, the role of science in society (and society in science), good conduct in science, biolegislation, popularization of science, and the role of scientific expertise in society. The discussions shall analyse ELSA of different subjects, such as bio banks or changing agricultural practises. The outcome of the WebCT discussions will be summarized and presented during the second set of lectures (lecture day).

**Realisation and working methods:** The course is composed of two times two days of lectures. These two sets of lectures are separated by a period when students participate in WebCT discussions. Lectures 34 h; WebCT discussions and group work 20 h; independent study 26 h.

**Study materials and literature:** To be provided during the course.

**Evaluation:** Participation in lectures; active contribution to WebCT discussions; written summary report on the WebCT discussion subject of student's choice.

**It is possible to pass following courses also in English:**

**ICT-driving licence, information technology skills 3 credits**

**Computer Science 2 (Y10) 3 credits**

**Isotope Technology, Lectures (Y35) 4 credits**

**Introduction to Scanning Electron Microscopy and X-ray Microanalysis (Y36) 1 credit**

**Isotope Technology, Laboratory Exercises (Y40) 3 credits**

### Courses in Finnish

**Farm Study and Practical Training (MAATHARJ) 3 credits**  
81801

**Timing:** Recommended after the first year of studies.

**Contents:** Practical training for 90 days and a written report describing the farm and production with profitability calculations. More instructions from the training coordinator.

**ICT-driving licence, information technology skills 3 credits**  
80088

**Timing:** Autumn and spring terms

**Responsible person:** Vesa Niskanen

**Objective:** Basic skills in information technology

**Contents:** Basic skills in information technology

**Realisation and working methods:** Independent studies, remedial instruction

**Study materials and literature:** Study materials, info and literature on the website: [www.mm.helsinki.fi/users/niskanen/verped/atkoep.htm](http://www.mm.helsinki.fi/users/niskanen/verped/atkoep.htm)

**Evaluation:** Passed / not passed



**Computer Science 2 (Y10) 3 credits**

80002

**Timing:** Autumn and spring terms

**Responsible person:** Vesa Niskanen

**Relations to other study units:** Relations to other study units

**Objective:** Additional skills in information technology

**Contents:** Additional skills in information technology

**Realisation and working methods:** Instruction, self-studies

**Evaluation:** Passed / not passed

**Isotope Technology, Lectures (Y35) 4 credits**

80012

**Timing:** Spring term, period III.

**Responsible person:** Chief Engineer Antti Uusi-Rauva.

**Relations to other study units:** The courses Y35 Isotope Technology, Lectures and Y40 Isotope Technology, Laboratory Exercises (with passed examination) qualify for radiation safety officer for the use of radiation in industry, research and teaching both with sealed and unsealed sources and X-ray machines. A certificate of qualification will be issued.

**Objective:** After the course the student will have basic knowledge of atomic physics and nuclear physics, radioactive decay and its applications in the scientific fields of the Faculty of Agriculture and Forestry and radiation protection.

**Contents:** Principles of nuclear physics, radioactivity and radioactive decay, interactions of radioactive radiation with matter, detection and measurement of radiation, mathematical and statistical analysis of measurement results, applications of radioactive radiation and tracers, radiation protection, biological effects of radiation. Nuclear plant excursion.

**Realisation and working methods:** Lectures 44, practical work 10, independent study 56 h.

**Evaluation:** Revision tests, which must be passed with a minimum grade of 1,5/3 and the final examination, which must be passed with a minimum grade of 1/3. The course is compulsory for those wishing to work at the Isotope Section. The time of the examination will be announced later.

**Other information:** Organized by the Isotope Section of the Instrument Centre of the Faculty of Agriculture and Forestry.

**Introduction to Scanning Electron Microscopy and X-ray Microanalysis (Y36) 1 credit**

80011

**Timing:** The dates to be agreed separately.

**Responsible person:** M.Sc. Simo Lehtinen, tel. +358 9 1915 8448, +358 400 475 288. By appointment at Mikrofokus Ltd. (Viikki, Latokartanonkaari 3).

**Objective:** Theoretical and practical Foundations of scanning electron microscopy and X-ray microanalysis (EDS).

**Realisation and working methods:** Lectures 5, practical work 15, independent study 5 hours.

**Study materials and literature:** Hand-outs as assigned.

**Evaluation:** Final examination.

**Other information:** All the students and researchers of the faculty who intend to use the scanning electron microscope, EDS or additional equipment of Mikrofokus Ltd. have to pass this course or alternatively obtain corresponding training given separately. The course is offered in cooperation with Mikrofokus Ltd. Department in charge: Instrument Centre of the Faculty of Agriculture and Forestry.

**Isotope Technology, Laboratory Exercises (Y40) 3 credits**

80013

**Timing:** Spring term, period IV. In the Isotope Section of the Instrument Centre.

**Responsible person:** Chief Engineer Antti Uusi-Rauva.

**Relations to other study units:** The courses Y35 Isotope Technology, Lectures and Y40 Isotope Technology, Laboratory Exercises (with passed examination) qualify for radiation safety officer for the use of radiation in industry, research and teaching both with sealed and unsealed sources and X-ray machines. A certificate of qualification will be issued.

**Objective:** Instruction in the use of isotope technology with analytical and research methods and measuring instruments. Includes instruction in working safely with radioactive materials.

**Contents:** Working safely with radioactivity in the isotope laboratory, monitoring of radiation exposure in radiation work, Geiger-Müller counting, gamma spectrometry, liquid scintillation counting, photosynthesis, autoradiography and preparation of liquid scintillation samples.

**Realisation and working methods:** Practical work 30, independent study 52 hours.

## Y courses

**Study materials and literature:** Hand-outs as assigned.

**Evaluation:** Approved report (1/3).

**Other information:** Organized by the Isotope Section of the Instrument Centre of the Faculty of Agriculture and Forestry.

**Introduction to Economics (Y50) 3 credits**  
80015

**Contents:** The basics of micro- and macroeconomics. Consumer theory, producer theory and market theory. Economic growth, market equilibrium, money and financial politics, open economy, European Monetary Union.

**Environmental problems in agriculture (Y51) 5 credits**  
80094

**Mathematics (Y54) 5 credits**  
81897

**Basic Course in Economics (Y55) 10 credits**  
80016

**Timing:** Autumn term

**Contents:** An introduction to 1) the microeconomics of consumer and producer theory themes of competition and markets, and 2) the macroeconomics of economic cycles, money and financial politics, international trade and currency politics.

**Advanced Microeconomic Theory (Y56) 11 credits**  
80096

**Basic Statistics (Y57) 5 credits**  
80090

**Presentation of Scientific Data (Y58) 5 credits**  
80092

**Economics (Y59) 10 credits**  
80093

**Commercial Law (Y60) 4 credits**  
80017

**Timing:** III period. Recommended in 2nd year of studies.

**Contents:** Contract law, tort law, company law and competition law.

**Managerial Accounting (Y75) 5 credits**  
80020

**Timing:** Periods III and IV. Recommended in 2nd year.

**Contents:** The basics of accounting and cost accounting.

**Land and Water Law (Y85) 4 credits**  
80023

**Contents:** Property formation, town planning, water rights legislation and environmental protection law. The course includes lectures, case studies and literature.

**Demonstration of Proficiency in High School Mathematics (Y96)**  
80025

**Timing:** The examination will be held at autumn and spring

**Contents:** High school mathematics

**Mathematics I (Y100) 5 credits**  
80085

**Timing:** Autumn term, period II.

**Contents:** Equations, integration, differentiation, differential equations, matrices, computer mathematics.

**Probability Theory (Y101C) 3 credits**  
83483

**Timing:** To be arranged

**Basic Course in Marketing (Y105) 5 credits**  
80028

**Timing:** Autumn term, periods I and II. Recommended in 1st year of studies.

**Contents:** Foundations and consumer orientation in marketing.

**Operational Research (Y115) 3 credits**  
80030

**Timing:** Spring term, period III.

**Contents:** Mathematical optimisation, mathematical modelling and solving of optimisation problems with various algorithms.

**Basic Course in Research (Y125) 2 credits**  
837005

**Timing:** Period III.

**Contents:** Basics of argumentation. The course includes an obligatory assignment.

**Basic Course in Research 2 (Y126) 2 credits**  
837006

**Timing:** Period IV.

**Contents:** The basics of scientific research methods. The course includes an obligatory assignment.

**Basics of Statistical Inference (Y130) 5 credits**  
80033

**Timing:** Autumn term, periods I and II.

**Contents:** The course includes scales, statistical measures, graphical representations, introduction to probability, sampling from normal distribution, statistical testing, confidence intervals, two-sample mean test, regression models, and tests for independence.

**Statistical Models 1: Analysis of Variance and Models of Regression and Correlation (Y131A) 5 credits**  
83430

**Timing:** Spring term, periods III and IV.

**Contents:** The course covers sections (1) analysis of variance and (2) regression and correlation models.

**Statistical Models 1: Models of Regression and Correlation and Sampling (Y131B) 5 credits**  
83431

**Timing:** Spring term, periods III and IV.

**Contents:** The course covers sections (2) regression and correlation models and (3) sampling techniques.

**Statistical Models 2. Variance Analysis (Y132A) 3 credits**  
83479

**Timing:** Spring term, period III.

**Statistical Models 2/Sampling (Y132B) 3 credits**  
83478

**Timing:** Spring term, period IV.

**Statistical Models 2: Multivariate Methods (Y132C) 3 credits**  
83419

**Timing:** To be arranged

**Contents:** Multivariate methods

**Other information:** Organizing Department: Forest Resource Management

**Statistical Models 2: Time Series Analysis (Y132D) 3 credits**  
83420

**Contents:** Time series analysis

**Other information:** Liability: Department Of Forest Resource Management

**Statistic models 2: Logistic models (Y132E) 3 credits**  
83432

**Contents:** Logistical models

**Other information:** Organizing Department: Forest Resource Management

**Statistical Models 2: Multivariate Methods, Continuation Course (Y132F) 3 credits**  
83480

**Contents:** Multivariate methods

**Other information:** Organizing Department: Forest Resource Management

**Statistical Models 2: Complementary Course in Analysis of Variance and Experimental Design (Y132G) 3 credits**  
83485

**Statistical Models 2: Response Surface Techniques (Y132H) 3 credits**  
83433

**Other information:** Organizing Department: Forest Resource Management

**Statistical Data Processing (Y136) 4-7 credits**  
80035

**Timing:** Autumn and spring terms

**Contents:** Basic skills for using statistical software

**Economics of Form and Basics of Accounting (Y145) 4 credits**  
80037

**Contents:** Accounting theory, basics of accounting and financial statements, profit calculation and taxation. The course includes assignments.

**Food Chain (Y150) 2 credits**  
812054

**Timing:** Recommended to be taken in the first study year.

**Objective:** The structure of the food chain, the concept of quality, quality control systems and environmental impacts of the food chain.

**Popularisation of Science (Y160) 3-5 credits**  
80062

**Contents:** Students are trained to write a popular article of their studies. And, they will get familiar with the role of science in different media.

## DEPARTMENT OF AGROTECHNOLOGY

The Department of Agrotechnology offers one major subject, Agricultural and Environmental Engineering. The major subject has two different specialisation lines, Agricultural Engineering and Environmental Engineering of Agriculture, both of which have the same technological and scientific basis in common. The Department is also in charge of the instruction in physics and work science given in common to students in many departments of the Faculty of Agriculture and Forestry.

### Head of the Department

Professor Jukka Ahokas

### Contact information

Department of Agrotechnology  
Koetilantie 3 (P.O. Box 28)  
FIN-00014 University of Helsinki  
tel. +358 9 1911  
fax +358 9 191 58 491 (Agricultural Engineering)  
Internet: <http://mm.helsinki.fi/mmtek/>

### Teaching staff in joint courses

Professor Jukka Ahokas  
Professor Anna-Maija Sjöberg  
University Lecturer Mikko Hautala  
Full-time Teacher Hanna-Riitta Kymäläinen

### REQUIREMENTS FOR THE BACHELOR'S DEGREE, 180 CREDITS

Applicable to both specialisation lines.

#### GENERAL STUDIES

Y96	Demonstration of Proficiency in High School Mathematics, 0 cr
Y125	Basic Course in Research, 2 cr
Y130	Basics of Statistical Inference, 5 cr
Y150	Food chain, 2 cr
MMTEK102	Production Environment and Hygiene, 2 cr
YKEM100	Chemistry, Lectures, 8 cr
KTB111	The Basics of Crop Production, 5 cr
KEL150	Introduction to Animal Production, 5 cr

MAE1	Basics of Agricultural Economics, 5 cr
MAATHARJ	Farm Study and Practical Training, 3 cr
AGTEK100	Personal Study Plan, 3 cr

#### MAJOR STUDIES

##### Basic studies

YFYS1	Physics I, 5 cr
YFYS2	Physics II, 5 cr
YFYS3	Physics III, 5 cr
YFYS4	Modelling, Numerical Solution and Simulation of Biosystems I, 5 cr
Y100	Mathematics I, 5 cr

##### Intermediate studies

AGTEK301	Seminar and Literature on the Bachelor's Thesis, 4 cr
AGTEK302	Bachelor's Thesis, 6 cr
	Maturity Essay

##### *Agricultural Engineering:*

AGTEK210	Development and Organizing of Research Work Processes, 7 cr
AGTEK310	Principles of Implement Usage, 15 cr

##### At least 30 credits from the following courses:

AGTEK320	Livestock Housing and Machinery, 5-15 cr
AGTEK330	Environmental Engineering, 5-15 cr
AGTEK340	Machine Design, 5-15 cr
AGTEK350	Soil Hydrology, 5-15 cr
MMTEK360	Basic studies of clean-technology, 5-15 cr

Or other courses by agreement with the department

##### *Environmental Engineering of Agriculture:*

MAA250	Soil Structure, 5 cr
MAA350	Soil Hydrology, 5 cr
AGTEK330	Environmental Engineering in Agriculture, 15 cr

##### At least 30 credits from the following courses:

AGTEK310	Principles of Implement Usage, 5-15 cr
AGTEK320	Livestock Housing and Machinery, 5-15 cr
AGTEK340	Machine Design, 5-15 cr
AGTEK350	Soil Hydrology, 5-15 cr

MMTEK360 Basic studies of clean-technology, 5-15 cr  
Or other courses by agreement with the department

**LANGUAGE STUDIES AND STUDIES IN INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)**

Second domestic language, 4 cr  
Foreign language, 3 cr  
ICT driving licence, 3 cr  
AGTEK300 Scientific Communication in Technology, 7 cr

**MINOR STUDIES, 25 CREDITS**

**FREE-CHOICE STUDIES, 11 CREDITS**

**REQUIREMENTS FOR THE MASTER'S DEGREE, 120 CREDITS**

Applicable to both specialisation lines.

**GENERAL STUDIES**

Y131 Statistical Models, 5 cr  
AGTEK400 Personal Study Plan (HOPS) and Tutoring for Master's Studies, 2 cr

**MAJOR STUDIES**

Advanced studies

AGTEK420 Advanced Practical Training, 3 cr  
AGTEK430 Development Prospects of Agricultural Technology, 10 cr  
AGTEK401 Research Practices in Agrotechnology, 7 cr  
AGTEK402 Prae Gradu Seminar, 5 cr  
AGTEK403 Pro Gradu Seminar, 7 cr  
AGTEK404 Master's Thesis, 40 cr  
Maturity Essay  
AGTEK405 Post Gradu Seminar, 5 cr

At least 20 credits from the following courses by agreement with the department:

*Agricultural Engineering:*

AGTEK440 Non-Food Technology, 5 cr  
AGTEK410 Plant Production Machinery, 5-15 cr

Other studies by agreement with the department

*Environmental Engineering of Agriculture:*

AGTEK440 Non-Food Technology, 5 cr

YFYS5 Modelling, Numerical Solution and Simulation of Biosystems I  
AGTEK450 Environmental Technology of Crop Production, 15 cr  
AGTEK460 Environmental Technology of Animal Production, 15 cr  
Other studies by agreement with the department

**LANGUAGE STUDIES AND STUDIES IN INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)**

Studies in ICT integrated in AGTEK402 (1 cr) and AGTEK405 (1 cr).

**OTHER STUDIES, 16 CREDITS**

**Course in English**

Teaching events in WebOodi

**Introduction to Biosystems Engineering. (NOVA-NORBE -Course) (IBE) 15 credits**  
822077

**Courses in Finnish**

**Personal Study Plan (HOPS) and Tutoring for Bachelor's Studies (AGTEK100) 2 credits**  
822049

**Development and Organizing of Research Work Processes (AGTEK210) 7 credits**  
822044

**Basics of Subdrainage (AGTEK220) 2-5 credits**  
82208

**Scientific Communication in Technology (AGTEK300) 7 credits**  
822050

**Seminar and Literature on the Bachelor's Thesis (AGTEK301) 4 credits**  
822045

**Bachelor's Thesis (AGTEK302) 6 credits**  
82252

**Principles of Implement Usage (AGTEK310) 5-15 credits**  
822053

Department of Agrotechnology

<b>Livestock Housing and Machinery (AGTEK320) 5-15 credits</b> 822054	<b>Development Prospects of Agricultural Technology (AGTEK430) 10 credits</b> 82262
<b>Environmental Engineering in Agriculture (AGTEK330) 5-15 credits</b> 822055	<b>Non-Food Technology (AGTEK440) 5-15 credits</b> 822062
<b>Machine Design (AGTEK340) 5-15 credits</b> 822056	<b>Participation in a Research Project (AGTEK480) 3-10 credits</b> 822070
<b>Automation of Agricultural Machinery (AGTEK350) 5-15 credits</b> 822057	<b>Post-Graduate Seminar (AGTEK700) 3 credits</b> 822075
<b>Special Course in Agrotechnology (AGTEK370) 5-15 credits</b> 82243	<b>Post-Graduate Course I (AGTEK710) 3-15 credits</b> 822076
<b>Participation in Project Work (AGTEK380) 4-15 credits</b> 822058	<b>Post-Graduate Course II (AGTEK711) 3-15 credits</b> 82275
<b>Personal Study Plan (HOPS) and Tutoring for Master's Studies (AGTEK400) 2 credits</b> 822090	<b>Final Examination for the Licentiate Degree (AGTEK720)</b> 82277
<b>Research Practices in Agrotechnology I (AGTEK401) 7 credits</b> 822091	<b>Production Environment and Hygiene (MMTEK102) 2-4 credits</b> 85218
<b>Pro Gradu Seminar (AGTEK402) 5 credits</b> 822092	<b>Methods in Cleanability Studies (MMTEK362) 6 credits</b> 822027
<b>Research Practices in Agrotechnology (AGTEK403) 7 credits</b> 822093	<b>Writing a Scientific Article (MMTEK770) 4-20 credits</b> 82281
<b>Master's Thesis (AGTEK404) 40 credits</b> 822094	<b>Physics I (YFYS1) 5 credits</b> 822014 <b>Timing:</b> Recommended in the first fall. Lectured autumn term, period I. <b>Contents:</b> Physical model thinking, SI-unit system, transportation phenomena (liquid, gas, heat and electricity), solid matter mechanical properties. Measured data processing, terminology, instruments and their properties.
<b>Post Gradu Seminar (AGTEK405) 5 credits</b> 822095	<b>Physics II (YFYS2) 5 credits</b> 822015 <b>Timing:</b> Recommended in the first fall. Lectured autumn term, period II.
<b>Plant Production Machinery (AGTEK410) 5-15 credits</b> 822059	
<b>Advanced Practical Training (AGTEK420) 3 credits</b> 82242	

**Contents:** Mass and energy balance, heat and matter transport and flow. Special emphasis on water movements and its causes, such as osmosis and water activity. Factors influencing gas and heat transport in biological systems (soil and plants).

**Physics III (YFYS3) 5 credits**

822016

**Timing:** Recommended in the first spring. Lectured spring term, period III.

**Contents:** Introduction to the physics laboratory: basic instruments, wiring, multimeters and oscilloscope. Measuring signal: what they are like, disturbances. Computer aided measurement: ADC and data loggers. Mechanics, strength of materials, heat-, flow- and moisture measurements. A course for everyone interested in measurement..

**Modelling, Numerical Solution and Simulation of Biosystems I (YFYS4) 5 credits**

822017

**Modelling, Numerical Solution and Simulation of Biosystems I (YFYS5) 5-15 credits**

822018

## DEPARTMENT OF ANIMAL SCIENCE

The Department of Animal Science has chairs in Animal Breeding (KEJAL) and Animal Nutrition (KERAV). These chairs are responsible for teaching and research in defined areas of animal production focusing on breeding, nutrition, feeding, physiology and health as well as management of the major species of domestic animals (cattle, pig, poultry, sheep, horse, fur animals, dog, reindeer). The department is also responsible for teaching and research in Animal Biotechnology.

The requirements for the Bachelor's degree are common for all students majoring in Animal Science. At the Master's level, students specialise in Animal Breeding or Animal Nutrition, which are the two specialisation lines of the major. A degree in Animal Science leads to career opportunities in teaching, research, consultative and administrative fields related to agriculture both nationally and internationally.

### Head of the Department

Professor Matti Näsi

### Contact information

Department of Animal Science  
P.O. Box 28  
FIN-00014 University of Helsinki, Finland  
tel. + 358 9 1911  
fax + 358 9 191 58 379  
<http://www.animal.helsinki.fi/>

### Teaching staff

University Lecturer Kari Elo  
University Lecturer Seija Jaakkola  
Assistant Tuomo Kokkonen  
University Lecturer Anna-Elisa Liinamo  
Professor Matti Näsi  
Professor Matti Ojala  
Professor Aila Vanhatalo  
Several external teachers

## Animal Science

### Animal Breeding (KEJAL)

The objective of animal breeding is to improve the genetic level of animals and animal groups with regard to economically important traits by observing the principles of sustainable development and taking into account the ethical aspects of animal production. The designing and the realisation of breeding schemes require, among other things, assessment of the heritability of different traits and of breeding values of animals, as well as assessment of the development of appropriate selection and mating procedures. Animal breeding research and the application of research results require sufficient basic knowledge of genetics, statistics, and data processing. Students specialising in animal breeding can elect, as their supplementary minor, subjects in meat technology, dairy technology, genetics, statistics, agricultural business economics, or biotechnology in the

Faculty of Agriculture and Forestry. In other faculties at the University of Helsinki, minor subjects may be taken in genetics, statistics, data processing, biochemistry, and physiology, among other fields. The department assists students in the selection of alternative courses.

### Animal Nutrition (KERAV)

Animal nutrition studies the nutrition physiology, metabolism and the nutritional requirements of domestic animals, and the composition of feeds and their suitability to various animal species. Animal nutrition also covers the efficiency of feed utilisation in various branches of production, the effects of feeding on the quality of animal products and the health of the animal. The care of domestic animals as well as environmental,



economical and behavioural aspects are taken into consideration.

Chemistry and biology are important basic subjects. Minor subject studies for those specialising in animal nutrition may include plant production, agricultural business economics, agricultural engineering, meat technology, dairy technology, microbiology, and biotechnology.

### **REQUIREMENTS FOR THE BACHELOR'S DEGREE, 180 CREDITS**

Applicable to both specialisation lines

#### **GENERAL STUDIES**

- KEL110 Introduction to Studies in Animal Science, 4 cr
- Y96 Demonstration of Proficiency in High School Mathematics, 0 cr
- Y150 Food chain, 2 cr
- KTB111 The Basics of Crop Production, 5 cr
- MAE1 Basics of Agricultural Economics, 5 cr
- MAATHARJ Farm Study and Practical Training, 3 cr
- KEL120 Anatomy of Farm Animals, 3 cr
- KEL130 Physiology of Farm Animals, 4 cr
- KEL135 Physiology of Farm Animals, Laboratory Exercises, 4 cr
- YKEM100 Chemistry, Lectures, 8 cr
- YKEM101 Chemistry, Laboratory Course, 5 cr
- 51019 Introduction to Biochemistry and Cell Biology (In Faculty of Biosciences), 3 cr
- 52081 Basics of Genetics (In Faculty of Biosciences), 3 cr
- Y130 Basics of Statistical Inference, 5 cr
- Y131A Statistical Models 1, 5 cr
- Y125 Basic Course in Research, 2 cr

#### **MAJOR STUDIES**

##### Basic studies

- KEL150 Introduction to Animal Production, 5 cr
- KEL160 Health and Welfare of Farm Animals, 5 cr
- KEL170 Principles of Farm Animal Nutrition, 5 cr
- KEL180 Introduction to Animal Breeding, 5 cr
- Other courses in Animal Science, 5 cr

#### Intermediate studies

- KEL200 Chemical Composition and Evaluation of Feeds, 5 cr
- KEL210 Production Physiology, Nutrition and Breeding of Cattle, 10 cr
- KEL220 Production Physiology, Nutrition and Breeding of Swine and Poultry, 10 cr
- KEL230 Animal Biotechnology, 8 cr
- KEL260 Practical Training in an Animal Production Organization or Company, 2 cr
- KEL310 Literature Examination 1, 5 cr
- KEL320 Research Process and Seminars 1, 5 cr
- KEL330 Bachelor's Thesis, 6 cr
- Maturity Essay

*At least 3 credits from the following courses:*

- KEL250 Special Topics in Animal Production
- Other courses by agreement with the department

#### **LANGUAGE STUDIES AND STUDIES IN INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)**

- Second domestic language, 4 cr
- Foreign language, 3 cr
- ICT driving licence, 3 cr

#### **OTHER STUDIES**

Studies in Animal Science according to a Personal Study Plan, 5 cr

#### **MINOR STUDIES, 25 CREDITS**

Minor studies according to a Personal Study Plan

### **REQUIREMENTS FOR THE MASTER'S DEGREE, 120 CREDITS**

Applicable to both specialisation lines

#### **GENERAL STUDIES**

30 credits, selected from among the following courses according to a Personal Study Plan, at least 5 credits from at least one group

##### *Group A: Chemistry, Biochemistry and Microbiology*

- BKEM100 Biochemistry I, 5 cr
- BKEM101 Biochemistry I Laboratory Course, 5 cr
- BKEM200 Biochemistry II, 5 cr

Department of Animal Science

BKEM201 Biochemistry II Laboratory Course, 5 cr  
BKEM300 Molecular Cell Biology, 5 cr  
MIKRO200 Basic Course in Microbiology, 5 cr  
or other studies by agreement

*Group B: Computer Science, Statistics, Mathematics*

Y132 Statistical Models 2D, E and/or G  
Y136 Statistical Data Processing  
Y100 Mathematics I, 5 cr  
Studies in methodology (offered by the Faculty of Natural Sciences)

*Group C: Genetics*

Studies in genetics (offered by the Faculty of Biosciences)

*Group D: Biotechnology, Physiology and Veterinary Medicine*

BIOT100 Biotechnology I: From Basic Research to Applications, 2 cr  
BIOT300 Biotechnology II -From Inventions to Commercialization, 3 cr  
Courses from the Faculty of Veterinary Medicine

*Group E: Other courses according to a Personal Study Plan*

Personal study plan (HOPS, 1 cr) integrated in KEJAL520 and KERA520

**MAJOR STUDIES**

Advanced studies in Animal Breeding

KEJAL410 Linear Models and Breeding Planning, 10 cr  
KEJAL420 Methods of Predicting Breeding Values, 5 cr  
KEJAL460 Practical Training at a Research Institute, 2 cr  
KEJAL510 Literature Examination 2, 7 cr  
KEJAL520 Research Process and Seminars 2, 7 cr  
KEJAL530 Master's Thesis, 40 cr  
Maturity Essay

*10 Credits from the following courses:*

KEJAL430 Genetic Resources and Animal Biotechnology, 8 cr  
KEJAL440 Molecular Genetic Markers in Animal Breeding, 5 cr  
KEJAL450 Methods of Assessing Variance Components, 5 cr

Other courses according to a Personal Study Plan

Advanced studies in Animal Nutrition

KERAV410 Ruminant Nutrition Physiology, 10 cr  
KERAV420 Feed Technology and Hygiene, 5 cr  
KERAV430 Practical Training in a Research Institute, 2 cr  
KERAV510 Literature Examination 2, 7 cr  
KERAV520 Research Process and Seminars 2, 7 cr  
KERAV530 Master's Thesis, 40 cr  
Maturity Essay

Other courses according to a Personal Study Plan

**LANGUAGE STUDIES AND STUDIES IN INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)**

ICT studies (1 cr) integrated in KEJAL520 and KERA520

**FREE-CHOICE STUDIES, 7-12 CREDITS**

**Courses in Finnish**

**Introduction to studies in animal science (KEL110) 4 credits**

815010

**Timing:** Autumn term, period I-II, recommended in the 1st year of studies

**Contents:** Introduction to the Department of Animal Science, teaching and research areas, and research resources. Demonstrations and exercises on milking, calving, feeding, heat detection and body condition scoring of dairy cows. Creation of the personal study plan (HOPS). Introduction to study techniques.

**Anatomy of farm animals (KEL120) 3 credits**

815014

**Timing:** Autumn term, period II, recommended in the 1st year of studies

**Contents:** The application of the general knowledge of natural sciences to animal science.

**Physiology of farm animals (KEL130) 4 credits**

815018

**Timing:** Spring term, period III-IV, recommended

in the 1st year of studies

**Contents:** The basics of the physiological functions of domestic animals.

**Physiology of farm animals, laboratory exercises (KEL135) 4 credits**

815020

**Timing:** Spring term, period III-IV, recommended in the 1st year of studies

**Contents:** Practicals in blood, circulation, respiration, digestion, metabolism and sensory organs.

**Introduction to animal production (KEL150) 5 credits**

815026

**Timing:** Autumn term, period II, recommended in the 1st year of studies.

**Contents:** Basics of animal nutrition, animal husbandry, animal breeding, and technology used in animal production.

**Health and welfare of farm animals (KEL160) 5 credits**

815030

**Timing:** Autumn term, period I-II, recommended in the 2nd year of studies

**Contents:** The principles of ethology, the concept of animal welfare, the environmental needs of farm animals and the principles farm animal health care.

**Principles of farm animal nutrition (KEL170) 5 credits**

815034

**Timing:** Autumn term, period I, recommended in the 2nd year of studies

**Contents:** Chemical composition and physiological functions of nutrients. Digestion of nutrients in monogastric and ruminant animals. Central metabolic pathways.

**Introduction to Animal Breeding (KEL180) 5 credits**

815038

**Timing:** Autumn term, period I, recommended in the 2nd year of studies

**Contents:** Breeding goals; quantitative traits; basic concepts of inheritance; frequency of genotypes and genes in a population; relationship and inbreeding; genetic model; variation in production traits; genetic variation, heritability and genetic correlations; breeding value and its prediction; selection and genetic

change; mating systems; basics of planning a breeding program.

**Chemical composition and evaluation of feeds (KEL200) 5 credits**

815046

**Timing:** Autumn term, period II, recommended in the 2nd year of studies

**Contents:** The basics of feed chemistry, the methods of feed analysis and determination of feed energy and protein values. The course includes two weeks of intensive laboratory work.

**Production physiology, nutrition and breeding of cattle (KEL/KEBIOT210) 10 credits**

815050

**Timing:** Spring term, period III-IV, recommended in the 2nd or 3rd year of studies, offered in even-numbered years (2008).

**Contents:** Production physiology of beef and dairy cattle. Nutrient requirements, ruminant feeds and feed intake, feeding in various production stages, feeding strategies, managing meat and milk production and composition. Objectives of cattle breeding, collection and analysis of data, traits in breeding program, total merit index and breeding program.

**Production physiology, nutrition and breeding of pigs and poultry (KEL/KEBIOT220) 10 credits**

815054

**Timing:** Spring term, period III-IV, recommended in the 2nd or 3rd year of studies, offered in odd-numbered years (2007).

**Contents:** The physiology of growth, metabolism, nutritional requirements, feeding and management in different areas of pig production. Goals and methods in swine breeding, testing methods, selection indexes, a breeding program and crossbreeding. The physiology and metabolism of egg production, chick production and nutritional requirements, feeding and management of laying hens and broilers.

**Animal Biotechnology (KEL/KEBIOT230) 8 credits**

815058

**Timing:** Part A: Autumn term, period II, recommended in the 2nd or 3rd year of studies, offered in even-numbered years (2006). Part

B: Autumn term, period II, recommended in the 2nd year of studies.

**Contents:** Part A: Female and male reproduction, basic reproduction anatomy and physiology, basics of reproduction animal biotechnology.

Part B: physiological biotechnology, genetic biotechnology, animal genomes, genetic variation, changes in gene and genotype frequencies, molecular genetic markers, gene maps and linkage maps, simply inherited traits, probabilities for carriers of recessive genes, quantitative trait locus, QTL mapping, main results of QTL mapping studies, marker assisted selection and marker assisted introgression, animal biotechnology today and tomorrow, ethical considerations.

**The special topics in animal production (KEL250) 2-5 credits**

815066

**Timing:** Recommended in the 2nd to 4th year of studies

**Contents:** Breeding, nutrition and management of different animals (for example horses, fur animals, sheep, dogs) and current topics in animal production.

**Practical training in an animal production organization or company (KEL260) 2 credits**

815070

**Timing:** Recommended II study year, summer

**Contents:** This practical training period makes students familiar with the activities of animal production organisations. Training consists of a period of at least one month of work for example in advisory organisation, feed industry, breeding organisation, AI organisation, test station, or some other equivalent establishment.

**Literature examination 1 (KEL310) 5 credits**

815086

**Timing:** Spring term, recommended in the 3rd year of studies.

**Objective:** The examination compiles and reviews the knowledge acquired during separate study periods.

**Research process and seminars 1 (KEL320) 5 credits**

815090

**Timing:** Autumn/spring term, period I - IV, recommended in the 3rd year of studies.

**Contents:** Literature searches, writing a scientific essay. Participation in at least eight

seminars based on a Bachelor's thesis. Presentation of a seminar on the topic of one's own essay.

**Bachelor's thesis (KEL330) 6 credits**

815094

**Timing:** Recommended in the 3rd year of studies

**Objective:** Practise in conducting literature searches and in writing a scientific essay.

**Linear models and breeding planning (KEJAL410) 10 credits**

81510

**Timing:** Spring term, period III-IV, recommended in the 3rd or 4th year of studies.

**Contents:** Part A: Describing data with linear models, statistical analyses (assuming fixed models) and interpretation of results.

Part B: Expected values, genetic (co)variances and genetic parameters, selection index for single and multiple traits, expected genetic change.

**Methods in prediction of breeding values (KEJAL420) 5 credits**

81568

**Timing:** Spring term, period IV, recommended in the 4th or 5th year of studies, offered in odd-numbered years (2007).

**Contents:** Variances and covariances of random variables, statistical models, the inverse of relationship matrix, estimation of the parameters of a model, mixed model equations, BLUP applications and their computing.

**Genetic resources and animal biotechnology (KEJAL/KEBIOT430) 8 credits**

81572

**Timing:** Recommended in the 4th or 5th year of studies, will be offered in 2007-2008.

**Contents:** Part A: Reproduction Physiology and Endocrinology in Farm Animals: induction and synchronisation of ovulation, embryo flushing, embryo transfer and freezing, collection of semen, evaluation and freezing of semen, and artificial insemination.

Part B: Embryo Transfer Technology: animal breeding using embryo transfer technology, major genes, molecular genetic markers, QTL-analysis, marker assisted selection, gene transfer and ethics.

Part C: Significance of Genetic Variation in Animal Breeding: rationale for conservation of

genetic resources, evaluation of endangered populations, methodology for the conservation of genetic resources.

**Molecular genetic markers in animal breeding (KEJAL/KEBIOT440) 5 credits**  
81576

**Timing:** Spring term, period III, recommended in the 4th or 5th year of studies, offered in odd-numbered years (2007).

**Contents:** Journal club, principles of working in a DNA laboratory, collecting samples and extracting DNA, the utilization of DNA sequences, selection of genetic markers, DNA amplification, genotyping of microsatellite markers, parentage testing and pedigree checking, construction of linkage map, visit to a DNA diagnostics laboratory.

**Variance component estimation methods (KEJAL450) 5 credits**  
81580

**Timing:** Spring term, period IV, recommended in the 4th or 5th year of studies, offered in even-numbered years (2008).

**Contents:** Statistical models used in estimating variance components; simulation of data; properties of estimation methods, expected values and variances; Henderson's methods I, II and III; Maximum Likelihood; Restricted Maximum Likelihood; computing algorithms; the functioning of variance component estimation programs.

**Practical training at a research institute (KEJAL460) 2 credits**  
81584

**Timing:** Recommended in the 4th or 5th year of studies

**Objective:** The training period offers students an opportunity to familiarise themselves with the activities of a research institute in their own field of study, as well as with the research in progress, the literature and the publication of results. Development of report writing skills.

**Literature examination 2 (KEJAL510) 7 credits**  
81588

**Timing:** Recommended in the 4th or 5th year of studies

**Objective:** The examination reviews the acquired knowledge and shows the ability of the students to apply their knowledge in their future duties.

**Research process and seminars 2 (KEJAL520) 7 credits**

81592

**Timing:** Period I-IV, recommended in the 4th or 5th year of studies.

**Contents:** Methods used in editing and analyzing field data sets, and some programs used. Discussion in group meetings, presentation of a study and work plan, and the results of the study. Participation in at least eight seminar based on a Master's thesis and presentation of a seminar on the topic of one's own study.

**Master's thesis (KEJAL530) 40 credits**

81596

**Timing:** Recommended in the 4th or 5th year of studies.

**Objective:** The thesis requires an in-depth knowledge of the research work conducted in the student's own field and the ability to formulate and solve problems independently.

**Literature 3 (KEJAL610) 7 credits**

81516

**Responsible person:** Professor Matti Ojala

**Objective:** A review of the most recent results pertaining to the field of animal breeding.

**Research seminar (KEJAL620) 2-3 credits**

81564

**Responsible person:** Professor Matti Ojala

**Contents:** Presentations and discussions of new research projects.

**Internordic post-graduate course (KEJAL630) 5 credits**

81565

**Responsible person:** Professor Matti Ojala

**Contents:** Changing topics according to the course programme of the Nordic workgroup.

**International post-graduate course (KEJAL640) 2-5 credits**

81566

**Responsible person:** Professor Matti Ojala

**Contents:** The course subject varies according to current research topics.

**Ruminant nutrition physiology (KERAV/KEBIOT410) 10 credits**

81672

**Timing:** Autumn term, period I-II, recommended in the 3rd or 4th year of studies, offered in odd-numbered years (2007).

**Contents:** Regulation of feed intake. Rumen fermentation and digestion kinetics of feed nutrients. Digestion and absorption of nutrients from various parts of alimentary tract. Metabolism of nutrients in liver, tissues and mammary gland. Biology of lactation. Introduction to dynamic modeling with the POWERSIM® -program and studying ruminant digestion on the basis of the internordic model.

**Feed Technology and Hygiene (KERAV/KEBIOT420) 5 credits**  
81677

**Timing:** Spring term, period III, recommended in the 3rd or 4th year of studies, offered in even-numbered years (2008).

**Contents:** Composition and quality of feed ingredients, processing methods, design and production of industrial feeds, feed hygiene and feed legislation. Theory and methods of ensiling on farm level.

**Practical training in a research institute (KERAV430) 2 credits**  
81684

**Timing:** Recommended in the 4th or 5th year of studies.

**Contents:** Training in research institutes offers students practical experience in animal nutrition research and an opportunity to see the implementation of acquired knowledge.

**Literature examination 2 (KERAV510) 7 credits**  
81688

**Timing:** Recommended in the 4th or 5th year of studies.

**Objective:** The aim is to deepen the student's theoretical knowledge obtained during previous courses.

**Research process and seminars 2 (KERAV520) 7 credits**  
81692

**Timing:** Period I-IV, recommended in the 4th or 5th year of studies.

**Contents:** Use of experimental animals, experimental models and the methods of animal nutrition research; experimental protocols and experimentation; calculation, analysis, interpretation and application of results; scientific writing. Participation in at least eight seminars based on a Master's thesis and giving a seminar on the topic of one's own study.

**Master's thesis (KERAV530) 40 credits**  
81696

**Timing:** Recommended in the 5th year of studies.

**Objective:** Preparing the thesis teaches the student to scientifically analyse and solve animal nutrition-related problems and to present the results both in written and oral form.

**Literature 3 (KERAV610) 7 credits**  
81634

**Objective:** A review of the most recent results pertaining to the field of animal nutrition.

**Research seminar (KERAV620) 2-3 credits**  
81635

**Responsible person:** Professor Matti Näsi  
**Contents:** Presentations and discussions of new research projects.

**Post-graduate course (KERAV630) 2-5 credits**  
81636

**Contents:** The course subject varies according to current research topics.

**Internordic post-graduate course (KERAV640) 5 credits**  
81637

**Contents:** Topics selected according to the course programme of the Nordic workgroup.

## DEPARTMENT OF APPLIED BIOLOGY

The Department of Applied Biology (DAB) provides instruction in 11 teaching subjects that have many factors in common. These disciplines share biology as the common scientific basis and represent applied sciences. Nevertheless, they also carry out basic research in order to strengthen the theoretical basis on which applications can rest. Most of the disciplines address questions that are essential to agricultural and horticultural crop production and that form the study subject Biology of Plant Production (horticulture, crop science, plant breeding, plant pathology, agricultural zoology, apiculture, agroecology), for which DAB carries the teaching responsibility at the Faculty of Agriculture and Forestry. A few study areas within Forest Ecology (forest tree breeding, forest pathology, forest zoology, game management) are currently also placed in DAB, but will be found in the Department of Forest Ecology from 2007 onwards. Studies of game management are associated with both agricultural and forestry environments.

The study subjects at DAB are linked to many others on the Viikki campus, including biosciences and veterinary sciences as well as the more ecologically oriented sciences. Biotechnology is a study subject that links departments and faculties in Viikki and at the Technical University in Helsinki. DAB is responsible for plant biotechnology in the teaching programme.

### Head of the department

Professor Kari Heliövaara (until December 31, 2006)

### Contact information

Department of Applied Biology  
P.O. Box 27  
FIN-00014 University of Helsinki  
Finland  
tel. +358 9 191 58348  
fax +358 9 191 58 582

## Biology of Plant Production

Biology of Plant Production covers plant production in agriculture and horticulture, its biological foundation and a broad spectrum of applications. The study and instruction provide the opportunity to go deeply into the biology of the plant production from molecular to ecosystem levels of biological organization. It is also possible to specialise in biotechnology. The acquired academic expertise qualifies for a broad range of employment opportunities in the public and private sector.

At the B.Sc. level, the studies are common to all the students, with only some specialisation in the final year. In addition to the courses offered on the campus, practical training is required at both the B.Sc. and M.Sc. levels.

At the M.Sc. level, the Biology of Plant Production includes six specialisation tracks: Agroecology, Plant Breeding, Crop Science, Plant Pathology, Agricultural Zoology, and Horticulture. Students choose one of these specialisation tracks according to their own interests. If the placement of students in these six specialisation tracks has to be done by the department, it is based on the study success in the first year's courses.

## REQUIREMENTS FOR THE BACHELOR'S DEGREE, 180 CREDITS

Applicable to all specialisation lines

### GENERAL STUDIES

KTB101	Introduction to Plant Production, 3 cr
Y150	Food chain, 2 cr
Y96	Demonstration of Proficiency in High School Mathematics, 0 cr
Y130	Basics of Statistical Inference, 5 cr
YKEM100	Chemistry, Lectures, 8 cr
BKEM100	Biochemistry I, 5 cr
52081	Principles of Genetics, 3 cr
52550	Plant Physiology and Plant Anatomy, Lectures, 3 cr
52086	Basic Microbiology, Lectures, 3 cr
KTB106	Elementary Botany (plant morphology and small identification of plants in plant production), 3 cr
KTB203	Practicals in Plant Physiology and Anatomy, 4 cr
KTB244	Plant Geography and Ecology, 3 cr
MAATHARJ	Farm Study and Practical Training, 3 cr
	or PTARH101 Obligatory Practical Training, 3 cr
MAE1	Introduction to Agricultural Economics, 5 cr
KEL150	Introduction to Animal Production, 5 cr

10-15 credits of elective studies from following courses or courses according to personal study plan:

YKEM101	Chemistry, Laboratory Course, 5 cr
YFYS1	Physics I, 5 cr
535026	Introduction to Meteorology and Weather Observations, 5 cr
BIOT200	Basic Course in Gene Technology, 2 credits
BIOT201	Laboratory Course in Gene Technology, 3 cr
MIKRO200	Basic Course in Microbiology, 5 cr
MIKRO220	Basic Laboratory Course in Microbiology, 5 cr
YMPS101	Basic Lectures in Environmental Science, 5 cr
52073	Lectures in Ecology, 3 cr

### MAJOR STUDIES

#### Basic studies

KTB111	The Basics of Crop Production, 5 cr
--------	-------------------------------------

KTB212	Physiology of Growth and Development of Crop Plants, 5 cr
KTB121	Introduction to Plant Pathology, 5 cr
KTB222	Weed Science: Introductory Course, 5 cr
KTB123	Agricultural Zoology, 5 cr
<u>Intermediate studies</u>	
KTB201	Agroecology Introductory Course, 5 cr
KTB213	Crop Production I (field crops), 5 cr
KTB214	Crop Production II (horticulture), 5 cr
KTB220	Plant and Forest Tree Breeding, 5 cr
MAA200	Principles of Soil Science, 5 cr
KTB202	Basics of Scientific Writing, 5 cr
KTB302	Bachelor's Thesis and Seminar, 10 cr
	Maturity Essay

At least 10-20 credits from the following:

#### *Agroecology*

AEKO403	Agroecosystem and Agrobiodiversity, 5 cr
AEKO301	Ecology of Food Systems - Web Course, 3 cr
LUOMU1.1	Organic Production Systems, 2 cr
LUOMU1.2	Organic Plant Production, 5 cr
ME350	Agriculture and Forestry in Developing Countries, 3 cr

#### *Agricultural Zoology*

KTB304	Fundamentals of Agricultural Zoology, 5 cr
KTB224	Introduction to Apiculture, 3 cr
MAEL401	Ecology of Soil Fauna, 3 cr
MAEL404	Special Courses in Agricultural Entomology, 2-9 cr
ME298	Pest Vertebrates, 3 cr
ME472	Insect Ecology, 3 cr
ME474	Special Courses in Applied Entomology, 2-9 cr
MEHI301	Bees, Beekeeping and Pollination, 8 cr
MEHI404	Special Courses in Apiculture, 2-9 cr

#### *Botany*

KASV451	Identification of Plants in Agriculture, 3-4 cr
KASV452	Identification of Plants in Environmental Sciences, 3 cr
KASV442	Plant Systematics, 3 cr
KASV432	Course on Macrofungi, 2 cr



KASV371 Literature Examination in Botany,  
2–3 cr

*Crop Science*

KVIL305 New Trends in Plant Production,  
5 cr  
KVIL403 Book Summary, 3 cr  
KVIL303 Quality of Field Crops, 5 cr  
KVIL304 Quality of Field Crops/Practicals,  
5 cr  
KTB403 Stress Physiology/Practicals, 5 cr  
RIKKA502 Literature in Weed Science, 3 cr

*Horticulture*

KBIOT301 Laboratory Course in Plant  
Biotechnology, 5 cr  
PTARH302 Controlling Growth Factors, 5 cr  
PTARH303 Postharvest Physiology and  
Technology, 5 cr  
PTARH304 Horticultural Botany, 5 cr  
PTARH401 Urban Greening and Urban  
Ecology, 5 cr  
PTARH403 Human Issues in Horticulture,  
5 cr

*Plant Breeding*

JAL201 Population and Quantitative  
Genetics, 5 cr  
KBIOT200 Plant Biochemistry and Cell  
Biology, 3 cr  
KBIOT300 Plant Biotechnology and  
Molecular Biology, 5 cr  
KBIOT301 Laboratory Course in Plant  
Biotechnology, 5 cr

*Plant Pathology*

KPAT401 Epidemiology and Ecology of Plant  
Pathogens, 5 cr  
KPAT402 Fungal Pathogens of Plants, 5 cr  
KPAT403 Bacteria, Viruses and Pathogen  
Diagnostics, 10 cr

**LANGUAGE STUDIES AND STUDIES IN  
INFORMATION AND COMMUNICATION  
TECHNOLOGY (ICT)**

Second domestic language, 4 cr  
Foreign language, 3 cr  
ICT driving licence, 3 cr

**MINOR STUDIES, 25 CREDITS**

**Courses in Finnish**

**Introduction to Plant Production (KTB101) 3  
credits**  
812022

**Contents:** During this course the first year  
studentS are introduced to university studies,  
especially the programme of plant production  
biology. They receive training in Finnish,  
including written and oral presentation, and  
write a personal study plan.

**Elementary botany (plant morphology and  
small identification of plants) (KTB106)  
3 credits**  
812076

**The basics of crop production (KTB111) 5  
credits**  
812000

**Timing:** Autumn term, Period I

**Contents:** History of crop production, climate  
aspects, ecological aspects, cultivation  
technology, soil and nutrition.

**Physiology of growth and development of  
crop plants (KTB112) 5 credits**  
812057

**Timing:** Autumn term, period II.

**Contents:** Seed propagation, vegetative  
propagation, micropropagation. Seed  
germination, seed testing, regulations involved in  
seed production. Development of monocot and  
dicot species. Flowering and fruit maturation.  
Overwintering and stresses.

**Introduction to plant pathology (KTB121)  
5 credits**  
812060

**Contents:** Basic facts about fungal, bacterial  
and viral plant pathogens and their control, the  
common plant diseases in Finland, laboratory  
exercises on plant pathogens, and an overview  
of the disease control methods used in  
agricultural and horticultural plant production in  
Finland

**Weed science: introductory course (KTB122)  
5 credits**  
812061

**Timing:** Autumn term, period II, every odd year

**Contents:** Basics of weed biology and ecology,  
management and control of weeds by biological,  
cultural, mechanical, chemical etc. methods.

Department of Applied Biology

Species identification, a collection of samples of 30 weed species, and a weed management plan for these species. Lectures, weed sample collection and the management plan.

**Agricultural zoology (KTB123) 5 credits**

812062

**Contents:** Basic knowledge of animal pests of cultivated plants, including their biology, significance and methods of control. Beneficial species and their utilization.

**Agroecology introductory course (KTB201) 5 credits**

812006

**Timing:** Autumn term, period II. Recommended during the 2nd year.

**Contents:** Basics of structure and function of agricultural ecosystems. Ecosystem services. Diversity in agriculture. Production cultures, production systems, cropping systems. Environmental impacts of plant production. Natural resources of production. Environmental and natural resource indicators. Sustainability and sustainable development in plant production.

**Basics of scientific writing (KTB202) 5 credits**

812039

**Contents:** Introduction to structure and writing of a scientific report and peer review process.

**Practicals in plant physiology and anatomy (KTB203) 4 credits**

812077

**Timing:** Second year

**Crop production I (field crops) (KTB213) 5 credits**

812058

**Timing:** Spring term, period III

**Contents:** Cereals, grassland, oilseeds, root and tuber plants, field grown vegetables, fibre plants, non-food plants and herbs. Basics of management techniques, yield formation and factors affecting quality.

**Crop production II (horticulture) (KTB214) 5 credits**

812059

**Timing:** Spring term, period IV.

**Contents:** Vegetables, flowers, fruits, berries and nursery plants.

**Plant and forest tree breeding (KTB220) 5 credits**

81000

**Contents:** Introduction to the principles of traditional selection breeding and applications of biotechnology and gene technology in plant breeding.

**Apiculture (KTB224) 3 credits**

83106

**Contents:** Basic knowledge of bees, beekeeping, and pollination ecology, and their significance to plant production and natural plants.

**Plant geography and ecology (KTB244/KASV244) 3-4 credits**

812078

**Timing:** second year or later, autumn term I

**Contents:** climates and thermic processes, circulation of water, nutrients and solids, tolerance and competitiveness of plants, structure, types and regionality of vegetation

**Special training (KTB301) 3 credits**

812063

**Timing:** 3rd or 4th summer

**Contents:** The students will be acquainted with operations and working methods of a research institute for a period of 3 months.

**Bachelor's thesis and seminar (KTB302) 10 credits**

812071

**Timing:** 3rd year

**Contents:** Students enter in detail into crop scientific problem solving via an examination of the scientific literature. During the process the students process text, write a thesis and introduce the thesis with public discussion and evaluation

**Fundamentals of agricultural zoology (KTB304) 5 credits**

812075

**Contents:** Basic concepts and research methods of agricultural zoology, practicals on insect systematics and identification; separate sections on mites and nematodes.

**Research methodology in the science of plant production (KTB402) 5 credits**

81237

**Timing:** Recommended for the fourth study

year. Given in autumn term, period II.

**Contents:** General scientific methodology, planning of research, field and laboratory experimentation as well as selected methods of statistical analysis.

**Stress physiology/ practicals(KTB404) 3 credits**  
812074

**Timing:** Autumn term 2006

**Contents:** Techniques to evaluate the physiological and metabolic changes in crops (photosynthesis, proteins, lipids, etc.)

**Practicals (KTB405) 5 credits**  
812040

**Timing:** Spring term

**Contents:** Measurement and analysis methods used in crop sciences. Information is obtained by conducting experiments and studying the scientific literature. Results will be reported in a written form and in a seminar.

**Seminar, plant production (KTB501) 2-3 credits**  
81238

**Timing:** 5th year

**Contents:** Students prepare and give an oral presentation on the results and the conclusions of their research.

## Agricultural Zoology

Agricultural Zoology is applied zoology involving the study of animals that are harmful to plant production. The objective of studies in Agricultural Zoology is to provide basic information about field cultivation and horticulture using ecologically and economically acceptable methods about the appearing pests and about other animals which are significant from the point of view of the plant production and about the reasons for the tuholaisongelma and about solving. The fields of specialisation are among others biological and integrated the pest control. In the studies of the apiculture the questions of the beekeeping are studied from many sides for example as the pollinators of cultivated plants as for wintering of bees, for diseases and pests and the bees' productive use.

### Teaching staff

Professor Heikki Hokkanen  
University Lecturer Päivi Lyytikäinen-Saarenmaa

### REQUIREMENTS FOR THE MASTER'S DEGREE, 120 CREDITS

#### GENERAL STUDIES

KTB402 Research Process in the Science of Plant Production, 5 cr  
Y131A Statistical Models 1, 5 cr  
Basic courses in ecology or environmental protection, 5 cr  
KTB411 Personal Study Plan in the Master's Degree, 1 cr

#### MAJOR STUDIES

##### Advanced studies

KTB301 Special Training, 3 cr  
KTB501 Seminar, Plant Production, 3 cr  
MAEL401 Ecology of Soil Fauna, 3 cr  
MAEL402 Biological Control of Insect Pests and Weeds, 3 cr  
MAEL403 Integrated Plant Protection, 5 cr  
ME473 Entomology, 4 cr  
ME472 Insect Ecology, 3 cr  
MAEL502 Advanced Literature of Agricultural Zoology, 5 cr  
or MEHI502 Advanced Literature of Apiculture, 5 cr  
MAEL503 Master's Thesis, 40 cr  
or MEHI503 Master's Thesis, 40 cr  
Maturity Essay

At least 14-19 Credits from following:

MAEL404 Special Courses in Agricultural Entomology, 6 cr  
MAEL501 Identification and Systematics, 2 cr  
MEHI301 Bees, Beekeeping and Pollination, 8 cr  
MEHI404 Special Courses in Apiculture, 11 cr  
ME474 Special Courses in Applied Entomology, 6 cr  
ME298 Pest Vertebrates, 3 cr

#### LANGUAGE STUDIES AND STUDIES IN INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)

ICT studies (1 cr) integrated in KTB501

#### OTHER STUDIES, 16-21 CREDITS

KTB304 Fundamentals of Agricultural Zoology, 5 cr  
KTB224 Apiculture, 3 cr

## Courses in English

### Teaching events in WebOodi

#### **Biological control of insect pests and weeds (MAEL402) 3 credits**

83208

**Timing:** Spring term, 2008, period IV

**Responsible person:** Prof. Hokkanen

**Objective:** Student understands the theory and practice of biological control in agriculture, horticulture and forest management.

**Contents:** Basics of biological pest control, its applications and potential in pest management. Principles and practice, microbiological control, use of entomophages, mass rearing and inundation, insect pathology, population dynamics.

**Realisation and working methods:** Lectures 26, practical work 20, independent study 134 h.

**Study materials and literature:** Hokkanen, H. M. T. & Lynch, J.M. (Eds:) 1995. Biological Control: Benefits and Risks. Cambridge University Press. 290 pp.

**Evaluation:** Final exam.

**Other information:** Previously SEL230.

#### **Bees, Beekeeping and Pollination (MEHI301) 8 credits**

83107

**Responsible person:** Prof. Ingemar Fries, Swedish University of Agricultural Sciences, Uppsala (See: [http://www.slu.se/index\\_eng.cfm](http://www.slu.se/index_eng.cfm)) Phone: +46-18-672073, Fax: +46-18-672890, E-mail: [ingemar.fries@entom.slu.se](mailto:ingemar.fries@entom.slu.se)

**Objective:** After completing the course the student will:

- understand how beekeeping as an industry is organised, as well as of its importance and scope
- know how bee colonies function as unit in order to understand how they should be cared for to obtain optimal returns
- be familiar with pollinating insects and their importance for our natural flora, their berries and fruits as well as seed production, and cultivation of fruits and berries
- know the most important groups of solitary and social bees
- be familiar with their biology and how they are affected in human farming landscapes and by disturbance of surrounding areas.

**Realisation and working methods:** Lectures 25 h, Exercises 75 h (compulsory), Excursions 25 h (compulsory)

**Study materials and literature:** Provided by organiser

**Evaluation:** Oral and written tests as well as exercise reports

**Other information:** Part of NOVA Apiculture Program, Replaces the former course MEHI110

## Courses in Finnish

#### **Ecology of soil fauna (MAEL401) 3 credits**

83134

**Timing:** Spring term, 2008, period IV

**Contents:** Basics of biological pest control, its applications and potential in pest management. Principles and practise, microbiological control, use of entomophages, mass rearing and inundation, insect pathology, population dynamics.

#### **Integrated plant protection (MAEL403) 5 credits**

83136

**Contents:** Principles, possibilities and limitations of methods to control pests, diseases and weeds; currently used chemical pesticides and biological control agents, their properties and mutual compatibility. Cultural, mechanical, biological, biotechnical, and genetic control methods, and their environmental impacts. Integration of various plant protection methods so that an optimal outcome is reached for the farmer as well as for the environment and society as a whole.

#### **Special courses in agricultural entomology (MAEL404) 2-9 credits**

83112

**Contents:** Special topics in agricultural zoology, such as contemporary pest problems, biodiversity, etc.

#### **Identification and systematics (MAEL501) 2 credits**

83133

**Contents:** Most important pest and beneficial species, exam on 316 arthropod species.

**Literature in agricultural zoology (MAEL502)  
5 credits**

83119

**Contents:** In-depth literature on some specific topic in agricultural zoology, such as population dynamics, expert systems, biological control, integrated control, entomological microbiology.

## Agroecology

Agroecology serves sustainable development in agriculture and food systems, with the focus on ecological sustainability. The courses are devoted to a study of agroecosystems, agrobiodiversity, and production systems. Issues of adaptive management of natural resources in agriculture, food system analysis, as well as ecological foundations of food security are included. Agroecologists are increasingly needed in society as experts to meet local and global development challenges for ecologically sustainable agriculture and food systems.

### REQUIREMENTS FOR THE MASTER'S DEGREE, 120 CREDITS

#### GENERAL STUDIES

KTB402 Research process in the science of plant production, 5 cr  
Y131 Statistical Models 1, 5 cr  
KEL150 Introduction to animal production, 5 cr  
Basic courses in environmental protection or biology of environmental protection, 5 cr  
Studies which support master thesis by agreement with the department, 10 cr  
Personal Study Plan in the Master's Degree, 1 cr

#### MAJOR STUDIES

##### Advanced studies

AEKO403 Agroecosystem and agrobiodiversity, 5 cr  
AEKO501 Sustainability in agrifood systems, 5-10 cr  
or LUOMU6 Organic food systems, 8 op  
KTB501 Seminar, plant production, 3 cr  
KTB301 Special training, 3 cr  
AEKO502 Agroecological literature, 5 cr

AEKO503 Master's Thesis in Agroecology, 40 cr

Maturity essay

At least 10 credits from the following:

AEKO301 Ecology of food systems - web course, 3 cr  
AEKO401 Intermediate agroecology and Farming systems, 15 cr  
AEKO402 Advanced agroecology and food systems, 15 cr  
LUOMU2 Organic food production, 10 cr  
LUOMU5 Organic quality, 8 cr  
LUOMU6 Organic food systems, 8 cr  
LUOMU7 Case study, 8 cr  
ME350 Agriculture and forestry in the tropical countries, 3 cr  
ME457 Participatory methods in natural resource management, 5 cr

#### LANGUAGE STUDIES AND STUDIES IN INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)

ICT studies (1 cr) integrated in KTB501

#### OTHER STUDIES, 18 CREDITS

According to personal study plan.

#### Courses in English

##### Teaching events in WebOodi

##### Ecology of food systems -web course (AEKO301/AE301) 3 credits

812053

**Timing:** Spring term, period III. Recommended 3rd year.

**Responsible person:** In Helsinki: Juha Helenius. See: <http://www.agroasis.org/>

##### Intermediate agroecology and farming systems (AEKO401/AE302) 15 credits

812023

**Timing:** Autumn term, period I. Recommended 3rd or 4th year. The course is primarily for students who have completed the Bachelor of Science degree or its equivalent in agriculture, economics, natural resources, human nutrition or other relevant applied social or natural sciences.

**Responsible person:** see: <http://www.agroasis.org/>

**Relations to other study units:** KTB201 or equivalent studies

**Objective:** After completing the course the

students should:

- Be able to describe and analyse farming systems
- Know how to link theoretical knowledge and concrete action
- Know how to acquire knowledge about their own learning
- Understand the structure and functioning of conventional and ecological (organic) food systems.
- Understand the links between disciplinary (sub-system) knowledge and systemic (holistic) approaches.
- Be familiar with the methods for systems analysis, including assessment of overall system sustainability.
- Have the ability to handle complexity and change
- Have the ability to link theory to real-life situations
- Have the ability to communicate and facilitate
- Have the ability to learn autonomously and lifelong

Through real-life case studies focusing on change processes in the farming system, students will learn how to deal critically and constructively with attitudes and value-based choices as important system elements. Through this process, attitudes of both students and actors in the farming system will be made explicit. Important attitudes of the students are being open minded, critical, spirited, determined, approachable, exploring and communicative. See: <http://kurs.nlh.no/PAE302/>

**Contents:** The course consists of two interlinked parts. The real-life project work includes description, analysis and redesign of farming systems. Lectures and seminars deal with Agroecology, Ecological agriculture, Systems thinking, Learning, Group dynamics, Agroecosystems, Sustainability, Ecological principles of farm design, Social Dimensions, Agronomic and Economic issues, and From farm to global scales. Students write a group report for their clients in the farming system. They also write an individual report where they reflect on agroecological issues of the project work as well as their own learning while preparing the group report. See: <http://kurs.nlh.no/PAE302>

**Realisation and working methods:** Every week throughout the course, different aspects of the course are evaluated by students and teachers in a plenary meeting. Towards the

end of the course there is a 2-3 hour whole course evaluation in a plenary meeting. In addition, the students make a comprehensive written evaluation of the course. They also are encouraged to participate in the web-based evaluation (Refleks). Feedback from students is continuously used to improve the course. A self evaluation is carried out annually by the NOVA working group of Agroecology/Ecological Agriculture together with teachers carrying major responsibilities in the PAE courses (301, 302 and 302) and the M.Sc. programme in Agroecology. See: <http://kurs.nlh.no/PAE302>

**Study materials and literature:** Literature will be presented in class. See: <http://kurs.nlh.no/PAE302/>

**Evaluation:** Group report 30%, individual report 30%, oral exam 30%, course contribution 10%. Basis for the evaluation is a written group report ('client document'), a written individual paper ('learner document'), an oral presentation and discussion of each student's individual paper (oral exam), and overall contribution to the course process. See: <http://kurs.nlh.no/PAE302/>

**Other information:** The course is organized in Ås, Norway, by Norwegian University of Life Sciences. Course grants are available through NordPlus. See: <http://www.agroasis.org/>

### **Advanced agroecology and food systems (AEKO402/AE303) 15 credits**

812026

**Timing:** Autumn term, period II. Recommended 3rd or 4th year.

**Responsible person:** see: <http://www.agroasis.org/>

**Relations to other study units:** AEKO401 / AE302

**Objective:** After completing the course the students should:

- Be able to describe and analyse food systems
- Know how to link theoretical knowledge and concrete action with regard to food systems
- Know how to acquire knowledge about their own learning
- Understand the structure and functioning of conventional and alternative food systems.
- Understand the links between disciplinary (sub-system) knowledge and systemic (holistic) approaches.
- Be familiar with the methods for systems analysis, including assessment of overall

system sustainability.

- Have the ability to handle complexity and change
- Have the ability to link theory to real-life situations
- Have the ability to communicate and facilitate
- Have the ability to learn autonomously and lifelong

Through real-life case work that emphasises change processes in the food system, the students meet many different actors in the food system. In this way, attitudes of both students as well as food system actors will be made explicit. Important attitudes are being open-minded, critical, spirited, determined, approachable, exploring and communicative. See: <http://kurs.nlh.no/PAE303/>. The course consists of two interlinked parts. In the real-life project work, redesign of food systems are dealt with. Students write a group report for their clients in the food system and an individual report where they reflect on their own learning while preparing the group report. In lectures and seminars the following themes are dealt with: Extension and rural development, global and local food systems, food distribution, consumer issues on food, systems ecology, food security, nutrient flows and recycling, intercultural learning, interview techniques, visionary thinking, dialogue, force field analysis, creative problem solving, facilitation. See: <http://kurs.nlh.no/PAE303/>.

**Realisation and working methods:** Every week throughout the course, different aspects of the course is evaluated by students and teachers in a plenary meeting. Towards the end of the course there is a 2-3 hour whole course evaluation in a plenary meeting. In addition the students make a comprehensive written evaluation of the course. Feedback from students is continuously used to improve the course. See: <http://kurs.nlh.no/PAE303/>.

**Study materials and literature:** Literature will be presented in class. See: <http://kurs.nlh.no/PAE303/>.

**Evaluation:** Group report: 30%, Individual report 30%, oral exam 30%, course contribution 10%. Basis for the evaluation is a written group report (client document), a written individual paper (learner document), an oral presentation and discussion of their individual paper (oral exam), and the students' overall contribution to the course process. See: <http://kurs.nlh.no/>

PAE303/.

**Other information:** The course is organized in Ås, Norway, by Norwegian University of Life Sciences. Course grants are available through NordPlus. See: [www.agroasis.org](http://www.agroasis.org)

### **Agroecosystem and agrobiodiversity (AEKO403) 5 credits** 812017

**Timing:** Autumn term, period II. Recommended timing 3rd or 4th year. In even-numbered years only, next time 2006.

**Responsible person:** Juha Helenius

**Relations to other study units:** KTB201 Agroecology: introductory course (Agroekologian perusteet), or other basic knowledge on agroecosystems and issues of sustainable management. Basic studies in plant production. Basic studies in agricultural sciences.

**Objective:** The objective is to:

- Learn to understand and use the concepts of ecology, ecosystem research, biodiversity research, and landscape ecology in the context of agricultural ecosystems.
- Get familiar with the major types of global agroecosystems
- Learn to conceptualize agroecosystems as complex human biotic, learning, and socioeconomic systems

**Contents:** Agricultural ecosystem: structure, biotic diversity, and communities in the producer, consumer, and decomposer subsystems. Production processes as energy and material flows in the ecosystem. Management options interpreted as regulation of the ecosystem structure and function. Characteristics of dominant agricultural ecosystems in major biomes of the world. Cropping systems and production. Expansion from the natural sciences interpretation of agroecosystems to include human learning, and socioeconomic sub-systems.

**Realisation and working methods:** Lectures 30, practical work 10, group work 20, independent study 70 hours.

**Study materials and literature:** Course binder and other pertinent material

**Evaluation:** Assignments and learner documents

### **Sustainability in agri-food systems (AEKO501) 5-10 credits** 812018

**Timing:** Spring term, period III. 4th or 5th year.

In even-numbered years only, next time 2008.

**Responsible person:** Juha Helenius

**Relations to other study units:** BSc thesis.

**Objective:** The objective is to learn about human food ecology, to create conceptual models of agriculture-based product systems, especially plant production-based food systems. Students also learn to identify variable qualitative and quantitative methods to gather information for analysing issues of ecological sustainability of such systems in their human socio-economic context.

**Contents:** Current issues of human food ecology, especially food security. Conceptualizing hierarchical models. Food chain models, global vs. local food system models. Global change and natural resources (esp. agrobiodiversity) in relation to food security. Agroecosystems as human biotic communities. Methods of industrial ecology of agri-food systems. (Optional 5 credits:) Rapid rural-urban appraisal of a local alternative food system (as a group assignment).

**Realisation and working methods:** Lectures 30, group work 130 (optional), independent study 100 hours

**Study materials and literature:** Course binder and pertinent material.

Atkins, P. & I. Bowler (2001) *Food in society*, 3 cr .

Evans, L.T. (1998) *Feeding the ten billion*, 2 cr .

Mononen, T. & T. Silvasti (toim.) (2006) *Ruokakysymys*, 1 cr .

Millstone, E. & T. Lang (2003) *The atlas of food. Who eats what, where and why*, 2 cr .

Tansey, G. & T. Worsley (1995) *The food system: a guide*, 2 cr .

**Evaluation:** Essay 30%, Exam 70%. (Assignment: passed / failed)

#### **Literature in agroecology (AEKO502) 5-10 credits**

812025

**Timing:** 5th year.

**Responsible person:** Juha Helenius

**Relations to other study units:** BSc thesis. AEKO403 or equivalent studies.

**Objective:** Widening and deepening of knowledge and understanding about agroecological research and its relevance as an applied science

**Contents:** Reading (and optionally, reporting)

**Realisation and working methods:** Literature exams and / or learner reports

**Study materials and literature:** Literature as agreed with the professor

**Evaluation:** Book exams 100%

#### **M.Sc. thesis in Agroecology (AEKO503) 40 credits**

812021

**Responsible person:** Juha Helenius

**Relations to other study units:** BSc thesis.

**Objective:** To learn the processes of scientific research, analysis and interpretation of the results, and reporting in scientific writing.

**Contents:** Formulation of a research hypothesis, testing it using appropriate methodology, analysis of results and their interpretation in relation to scientific literature; reporting the study as a thesis and an oral presentation.

**Realisation and working methods:** Independent research work, writing process, peer workshops

**Study materials and literature:** Scientific literature relating to the research problem

**Evaluation:** Grading is based on each student's own contribution in planning and executing the research, and on quality of the report

## **Crop Science**

Crop Science (field crops, formerly crop husbandry) is a discipline that studies the crop physiological phenomenon of cultivated plants. In addition to understanding the genetic, morphological, physiological, biochemical and ecological properties of the cultivated plants their response to the different environmental and growth factors should be managed. A central subject in crop science is to seek and provide solutions to produce high quality crops both ecologically and economically, taking into account the environmental factors. The methods used in crop science vary from the molecular and cell level up to the single plant and field level. The present study subjects in crop science are, among others, the response of cultivated plants to environmental stresses, the possibilities to affect the yield and quality of the crops. The main objective in teaching is to orientate the students in the biology of field crops.

The objective in teaching weed science is to provide strong basic knowledge of weed biology and ecology, weed population dynamics and



control of weeds. The research in weed science is mainly concentrated on the interaction of weeds with the cultivated plants. Weed science is closely connected to agroecology, plant pathology and agricultural zoology. The control of weeds includes cultivation techniques, chemical, mechanical and biological control which link weed science closely to crop science. Weed science is also closely connected to environmental sciences.

### Teaching staff

Professor Pirjo Mäkelä  
University Lecturer Mervi Seppänen

### Contact information

Department of Applied Biology  
P.O. Box 27 (Latokartanonkaari 5)  
FIN-00014 University of Helsinki  
Finland  
tel. +358 9 191 58 356  
fax +358 9 191 58 463  
Internet: <http://mm.helsinki.fi/mmsbl/kvil>

## REQUIREMENTS FOR THE MASTER'S DEGREE, 120 CREDITS

### GENERAL STUDIES

KTB402 Research Methodology in the Science of Plant Production, 5 cr  
Y131A Statistical Models 1, 5 cr  
YKEM101 Chemistry, Laboratory Course, 5 cr  
535026 Introduction to Meteorology and Weather Observations, 5 cr  
Personal Study Plan in the Master's Degree, 1 cr

### MAJOR STUDIES

#### Advanced studies

KVIL303 Quality of Field Crops, 5 cr  
KVIL304 Quality of Field Crops/Practicals, 3 cr  
KVIL404 Seeds and Seedlings of Weeds and Cultivated Plants, 2 cr  
KTB401 Crop Physiology, 5 cr  
KTB405 Crop Physiology, Practical, 5 cr  
KTB403 Stress Physiology, 5 cr  
KTB404 Stress Physiology/Practicals, 3 cr  
KTB301 Special Training, 3 cr  
KTB501 Seminar, Plant Production, 3 cr  
KVIL502 Literature Exam, 5 cr  
KVIL503 Master's Thesis, 40 cr  
Maturity Essay

## LANGUAGE STUDIES AND STUDIES IN INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)

ICT studies (1 cr) integrated in KTB501

### OTHER STUDIES, 18 CREDITS

KVIL305 Current Issues in Crop Science, 3 cr

RIKKA502 Literature in Weed Science, 3 cr

MAA240 Plant Nutrition, 5 cr

## Courses in English

### Teaching events in WebOodi

### Physiology of growth, development and yield formation (KTB401) 5 credits

812002

**Timing:** Every second year. Next time on spring term 2007, period III/IV

**Responsible person:** Pirjo Mäkelä

**Objective:** To understand physiology of yield formation of crops through nitrogen, carbon and phytohormone metabolism.

**Contents:** Growth, development and yield formation of crops. Effect of carbon and nitrogen metabolism on production biology. Phytohormones and plant growth regulators.

**Realisation and working methods:** Lectures 38, practical work 0, group work 45, independent study 50 hours

**Study materials and literature:** Taiz, L. ja Zeiger, E. 2002. Plant Physiology. 3. ed.

**Evaluation:** Examination and group work

### Stress physiology (KTB403) 5 credits

812016

**Timing:** Next time in autumn term 2007.

**Responsible persons:** Mervi Seppänen and Kurt Fagerstedt

**Relations to other study units:** KTB404

**Objective:** Introduce students to most important abiotic stresses and the effect of those on physiological and biochemical changes in crops.

**Contents:** Effect of different stresses such as drought, temperature, salinity and air pollutants to physiology, growth, development and yield formation of crops. Stress tolerance

**Realisation and working methods:** Lectures 36, practical work 0, group work 40, independent study 57 hours.

**Evaluation:** Examination

**Literature in weed science (RIKKA502)  
3 credits**

81254

**Responsible person:** professors in agroecology and crop science

**Relations to other study units:** KTB122

**Objective:** To learn and understand current issues and central themes in weed science.

**Contents:** Learning diary and review based on the literature.

**Realisation and working methods:** Independent working (instructions from the teachers).

**Study materials and literature:** Latest textbooks in weed science

**Evaluation:** Review 70%, learning diary 30%

**Literature in crop science (KVIL502)  
5 credits**

812056

**Timing:** 5th year

**Responsible person:** Pirjo Mäkelä

**Objective:** Introduce the students to the essential scientific literature of crop science.

**Study materials and literature:** Hay, R. and Porter, J. 2005. Physiology of Crop Yield. In addition another scientific publication, arranged with professor.

**Evaluation:** Examination

**Other studies on crop science (KVIL401)**

81248

**Contents:** Studies on crop science completed in other universities. Contact the professor for arrangements.

**Practical training in research group (KVIL402) 3 credits**

81249

**Contents:** Students can earn credits by working in a research group of crop science. Contact the professor for arrangements.

**Book summary (KVIL403) 3 credits**

81245

**Contents:** The student will choose a book dealing with crop science. The book will have to be accepted by the professor. The student will study the book, gather information and write a referate.

**Seeds and seedlings of weeds and cultivated plants (KVIL404) 2 credits**

812079

**Timing:** 3rd or 4th year

**Objective:** Identification of the most important seeds and seedlings of weeds and cultivated plants.

## Courses in Finnish

**Quality of field crops (KVIL303) 5 credits**

81244

**Timing:** Autumn term, period II

**Contents:** The course will give an overview of the requirements for processing quality of various crop species. Genetic and non-genetic factors affecting crop quality are discussed.

**Quality of field crops/ practicals (KVIL304)  
5 credits**

812073

**Timing:** Autumn term, period II

**Contents:** Techniques to evaluate the quality of field crops.

**Current issues in Crop Production (KVIL305)  
5 credits**

81236

**Timing:** Spring term, period III

**Contents:** The course will introduce new applications in crop production.

## Horticulture

Instruction and training in horticulture provides students with a basic knowledge of production and storage of horticultural crops: fruits, berries, vegetables and ornamentals. The horticulture courses also cover skills needed in the landscaping industry. The main emphasis is on the biological aspects of horticulture including the molecular level. The courses embrace cultivation techniques and their effects on the quality and quantity of crops and on the environment. The research-based teaching aims to educate students to find, produce, evaluate and apply new information related to horticulture. Studies include practical working experience in horticultural industry. Studies of horticulture can also be supported with studies in economics, technology, biotechnology and environmental protection.

### Contact information

Department of Applied Biology  
Horticulture  
P.O. Box 27 (Latokartanonkaari 5)  
FIN-00014 University of Helsinki  
Telefax +358 9 191 58582  
Internet: <http://mm.helsinki.fi/mmsbl/ptarh>

### Teaching staff

Professor Paula Elomaa  
University Lecturer Pauliina Palonen  
University Lecturer Leena Lindén

## REQUIREMENTS FOR THE MASTER'S DEGREE, 120 CREDITS

### GENERAL STUDIES

Y131 Statistical Models 1, 5 cr  
KTB402 Research Methodology in the Science of Plant Production, 5 cr  
MAA240 Plant Nutrition, 5 cr  
KTB411 Personal Study Plan, 1 cr

### MAJOR STUDIES

#### Advanced studies

PTARH402 Photobiology, 5 cr  
KTB401 Physiology of Growth, Development and Yield Formation, 5 cr  
KTB403 Stress Physiology, 5 cr  
KTB404 Stress Physiology/Practicals, 3 cr  
KTB405 Practicals, Plant Production, 5 cr  
KTB501 Seminar, Plant Production, 3 cr  
KTB301 Special Training, 3 cr  
PTARH502 Literature in Horticulture, 5 cr  
PTARH503 Master's Thesis, 40 cr  
Maturity Essay

### LANGUAGE STUDIES AND STUDIES IN INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)

ICT studies (1 cr) integrated in KTB501

### OTHER STUDIES

KBIOT301 Laboratory Course in Plant Biotechnology, 5 cr  
PTARH302 Controlling Growth Factors, 5 cr  
PTARH303 Postharvest Physiology and Technology, 5 cr  
PTARH304 Horticultural Botany, 5 cr  
Additional elective studies 10-20 credits, for example:  
PTARH305 Alternative Studies in Horticulture, 3-5 cr

PTARH401 Urban Greening and Urban Ecology, 5 cr  
PTARH403 Horticulture for Human Well-being, 5 cr  
PTARH404 Project Study, 5-10 cr  
KVIL303 Quality of Field Crops, 5 cr  
BIOT200 Basic Course in Gene Technology, 2 cr  
BIOT201 Laboratory Course in Gene Technology, 3 cr  
KBIOT200 Plant Biochemistry and Cell Biology, 5 cr  
KBIOT300 Plant Biotechnology and Molecular Biology, 5 cr  
JAL504 Breeding of Agricultural and Horticultural Crop Plants, 5 cr  
AEKO403 Agroecosystem and Agrobiodiversity, 5 cr  
AEKO501 Sustainability in Agri-food System, 5 cr  
AEKO503 Literature in Agroecology, 5 cr  
Y136 Statistical Data Processing, 5-7 cr

### Courses in English

#### Teaching events in WebOodi

#### Postharvest physiology and technology (PTARH303) 5 credits

824000

**Timing:** Autumn term, period II. Offered in odd-numbered years; recommended in the 3rd year of studies.

**Responsible person:** Paula Elomaa

**Relations to other study units:** KTB213 and KTB214

**Objective:** The student will learn the principles of plant postharvest physiology, storage technology and the factors affecting the inner and outer quality of horticultural crops.

**Contents:** Postharvest physiology and technology. Pre- and postharvest factors influencing the quality of horticultural products (vegetables, fruits, berries and ornamental plants).

**Realisation and working methods:** Lectures 26 h, practical work 0 h, group work 10 h, independent study 90 h.

#### Study materials and literature:

Wills, R., McGlasson, B., Graham, D. & Joyce, D. 1998. Postharvest. An introduction to the physiology & handling of fruit, vegetables & ornamentals. Wallingford, CAB International. 292 p.

Kader, A. A. (ed.). 1992. Postharvest technology of horticultural crops. 2nd ed. Oakland, CA, University of California. 296 p.  
**Evaluation:** Written examination.

**Photobiology (PTARH402) 5 credits**  
82422

**Timing:** Spring term, period IV. Offered in odd-numbered years; recommended in the 3rd or 4th year of studies.

**Responsible person:** Paula Elomaa

**Objective:** The student will learn to know the effects of light on plants and the use of artificial lighting in greenhouse production.

**Contents:** Influence of light on growth and development of plants. Interaction of light and other growth factors. Artificial lighting in greenhouse production.

**Realisation and working methods:** Lectures 26 h, practical work 0 h, group work 10 h, independent study 90 h.

**Study materials and literature:** Relevant literature will be indicated during the course.

**Evaluation:** Written examination.

**Horticulture for human well-being (PTARH403) 5 credits**  
82492

**Timing:** Spring term, period III. Offered in odd-numbered years; recommended in the 3rd or 4th year of studies.

**Responsible person:** Erja Rappe

**Objective:** The student will learn to know the influence of plants, gardens and landscape on the well-being of individuals and communities.

**Contents:** The influence of plants, gardens and landscape on the well-being of individuals and communities. Therapeutic use of horticulture. Planning of healing landscapes. Horticulture in environmental education.

**Realisation and working methods:** Lectures 20 h, practical work 20 h, group work 40 h, independent study 50 h.

**Study materials and literature:**

Cooper Marcus, C. & Barnes, M. 1999. Healing Gardens. John Wiley & Sons Inc., New York. Chapters 1 and 2.

Lewis, C. A. 1996. Green Nature / Human Nature. The meaning of plants in our life. University of Illinois Press, Urbana.

Articles provided during the course.

**Evaluation:** Accepted practical work / seminar.

## Courses in Finnish

**Obligatory practical training (PTARH101) 3 credits**

82405

**Timing:** Practical training is recommended to be taken after the first or second year of studies.

**Contents:** Practical training and working at different training and working places for 80 days. Training can be performed in two different phases (40 + 40 days). More instructions from the teachers.

**Voluntary practical training (PTARH201) 3 credits**

824002

**Contents:** Practical training and working at different training and working places for 60 days. More instructions from the teachers.

**Controlling growth factors (PTARH302) 5 credits**

82485

**Timing:** Teaching is given every other spring term

**Objective:** Student will acquire basic knowledge of controlling growth factors (light, temperature, air constituents) in greenhouse production.

**Horticultural botany (PTARH304) 5 credits**

82400

**Timing:** Teaching is given every other autumn term.

**Contents:** Taxonomy of horticultural plants and basics of species identification. The most important horticultural species produced in Finland or used as landscape plants (420 species) are examined in one exam.

**Alternative studies in horticulture (PTARH305) 5-7 credits**

82416

**Contents:** Special lectures or practical courses in horticulture or studies completed in other universities. To be included, the course must be agreed with professor before it is taken.

**Urban greening and urban ecology (PTARH401) 5 credits**

82487

**Timing:** Autumn term, offered in odd-numbered years.

**Contents:** Ecological requirements of landscape design, construction and maintenance. The

value of urban greenery and principles of landscape design.

**Project study (PTARH404) 5-10 credits**  
82435

**Timing:** Advanced level.

**Contents:** An advanced level course, where the student will apply horticultural methods to an independent study involved in horticultural planning and development. The project work and extent have to be discussed and agreed with the professor before the start of the project.

**Literature in horticulture (PTARH502) 5 credits**  
82495

**Objective:** Literature required for Master's degree. The aim is to deepen the knowledge acquired on previous courses in horticulture.

**Master's Thesis (PTARH503) 40 credits**  
82443

**Contents:** Formulation of a research hypothesis, testing it using appropriate methodology, analysis of results and their interpretation in relation to scientific literature; reporting the study as a thesis and an oral presentation.

## Plant Breeding

Plant Breeding is applied genetics. Plant breeding aims to increase the exploitation of plants and the ability to react swiftly to changing climatic and opinion environments. Instruction is provided in the basics of plant genetics and in population genetic methods as applied to plant breeding. In addition, plant breeding also utilizes modern methods of biotechnology and DNA studies. The objective of instruction in plant breeding is to prepare students for employment as plant breeders and researchers in Finland and abroad. Studies include also practical laboratory and summer courses, and training in plant breeding organizations.

**Teaching staff**

Professor Teemu Teeri  
University Lecturer Helena Korpelainen

**Contact information**

Department of Applied Biology  
P.O. Box 27  
FI-00014 University of Helsinki  
Finland  
tel. +358 9 1911  
fax +358 9 191 58 434  
Internet: [http:// www.helsinki.fi/mmtdk](http://www.helsinki.fi/mmtdk)

## REQUIREMENTS FOR THE MASTER'S DEGREE, 120 CREDITS

**GENERAL STUDIES, 21 cr**

KTB402 Research Process in the Science of Plant Production, 5 cr

Y131A Statistical Models 1, 5 cr

KTB411 Personal Study Plan, 1 cr

At least 10 credits from the following:

Y100 Mathematics 1, 5 cr

Y132 Statistical Models 2, 5 cr

Y136 Statistical Data Processing, 5 cr

KTB401 Physiology of Growth, Development and Yield Formation, 5 cr

KTB403 Stress Physiology, 5 cr

KTB405 Practicals, 5 cr

BIOT200 Basic Course in Gene Technology, 2 cr

BIOT201 Laboratory Course in Gene Technology, 3 cr

**MAJOR STUDIES, 73-81 cr**

Advanced studies

KTB301 Special Training, 3 cr

JAL401 Selection Breeding and Experimental Designs, 5 cr

JAL504 Breeding of Agricultural and Horticultural Crop Plants, 5 cr

KTB501 Seminar, Plant Production, 3 cr

JAL502 Literature, 10 cr

JAL503 Master's Thesis, 40 cr  
Maturity Essay

7-15 credits from the following:

JAL402 Conservation of Plant Genetic Resources, 5 cr

JAL403 Molecular Methods in Applied Plant Genetics, 5 cr

JAL505 Forest Tree Breeding, 5 cr

JAL506 Other Studies in Breeding, 3-5 cr

KBIOT300 Plant Biotechnology and Molecular Biology, 5 cr

KBIOT301 Laboratory Course in Plant Biotechnology, 5 cr

Department of Applied Biology

KBIOT401 Laboratory Course in Plant Molecular Biology, 5 cr  
ME463 Advanced Molecular and Conventional Methods in Forest Pathology, 8 cr  
KPAT501 Plant-microbe Interactions and Molecular Defense of Plants, 10 cr  
PTARH303 Postharvest Physiology and Technology, 5 cr  
PTARH402 Photobiology, 5 cr

Other courses in accordance with the personal study plan

**LANGUAGE STUDIES AND STUDIES IN INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)**

ICT studies (1 cr) integrated in KTB501

**OTHER STUDIES, 16-24 CREDITS**

JAL201 Population and Quantitative Genetics, 5 cr

KBIOT200 Plant Biochemistry and Cell Biology, 3 cr

Other studies according to Personal Study Plan.

**Courses in English**

**Teaching events in WebOodi**

**Plant Biotechnology and Molecular Biology (KBIOT300) 5 credits**

81085

**Timing:** Spring term, period III

**Responsible person:** Prof. Teemu Teeri (Faculty of Agriculture and Forestry), Doc. Pekka Heino and Prof. Jaakko Kangasjärvi (Faculty of Biosciences)

**Relations to other study units:** KBIOT200

**Objective:** Learning of different aspects of plant biotechnology and molecular biology

**Contents:** Lectures include: Molecular biology of agrobacterium-mediated gene transfer; Gene transfer methods and vectors for plant transformation; Plant genome structures; Molecular biology of light perception and signal transduction in plants; Pathways to plant secondary metabolites; Molecular basis of vegetative-reproductive transitions and flower development; Molecular basis of abiotic and biotic stress responses in plants; Applications in plant biotechnology; Forest biotechnology; Basics of legislation and risk assessment in plant biotechnology

**Realisation and working methods:** Lectures 39 h, Practical work 0 h, Group work 0 h,

Independent study 96 h.

**Study materials and literature:** Lecture material + additional reading given by the lecturers in the net (WebCT). Literature: Buchanan, B.B, Gruissem, W & Jones, R.L, 2002: Biochemistry and Molecular Biology of Plants. 1408 pages (relevant parts).

**Evaluation:** Short written assignment, final examination

**Other information:** Previously KASV67. The course is given jointly by the Faculty of Agriculture and Forestry and the Faculty of Biosciences

**Laboratory Course in Plant Biotechnology (KBIOT301) 5 credits**

81028

**Timing:** Spring term, period IV

**Responsible person:** Prof. Teemu Teeri (Faculty of Agriculture and Forestry) and Doc. Annikki Welling (Faculty of Biosciences)

**Relations to other study units:** KBIOT300

**Objective:** Learning of the basic techniques of plant cell culture and plant gene transfer

**Contents:** The laboratory practicals include relevant techniques in plant cell culture (callus and suspension cultures, haploid cultures, protoplast isolation and micropropagation) as well as techniques related to plant gene transfer methods (agrobacterium-mediated, particle bombardment, reporter genes and infiltration)

**Realisation and working methods:** Lectures 0 h, Practical work 120 h, Group work 0 h, independent study 15 h.

**Study materials and literature:** Course manual

**Evaluation:** Laboratory report

**Other information:** Previously KASV70. The course is given jointly by the Faculty of Agriculture and Forestry and the Faculty of Biosciences

**Laboratory Course in Plant Biology (KBIOT401) 5 credits**

812010

**Timing:** Spring term, period III.

**Responsible person:** Prof. Teemu Teeri

**Relations to other study units:** BIOT200, BIOT201, KBIOT200 and KBIOT300

**Objective:** Learning of some basic techniques in plant molecular biology

**Contents:** Construction of floral cDNA libraries; Basics of sequence analysis and bioinformatics; Analysis of gene expression in transgenic lines

using Northern hybridisation

**Realisation and working methods:** Lectures 0 h, Practical work 104 h, Group work 0 h, Independent study 31 h.

**Study materials and literature:** Course manual

**Evaluation:** Laboratory report

**Other information:** Previously KAT5. Priority given to advanced level students. The course will be offered in even-numbered years.

**Selection breeding and experimental designs (JAL401) 5 credits**  
81039

**Timing:** Recommended to be taken during the fourth or fifth year of studies. Course will be offered in the spring term, period III.

**Responsible person:** Teemu Teeri

**Objective:** To understand the process of selection breeding and to learn how to plan experiments in plant breeding and forest tree breeding.

**Contents:** The role of genotype, environment, G×E interaction and random effects in determining variation in plants. The structure of breeding trials to separate genetic and environmental effects. Applications of selection work.

**Realisation and working methods:** Lectures 28 h, independent study 105 h.

**Study materials and literature:** Relevant literature will be indicated during the course.

**Evaluation:** Examination 70%, presentation 30%.

**Other information:** The course will be offered in odd-numbered years in the spring term.

**Conservation of plant genetic resources (JAL402) 5 credits**  
81041

**Timing:** Recommended to be taken during the fourth or fifth year of studies. Course will be offered in the spring term, period IV.

**Responsible person:** Helena Korpelainen

**Objective:** The importance of genetic variation and plant genetic resources. Methods of assessing and conserving genetic resources. Applications in plant breeding.

**Contents:** The nature of biological diversity, applications of ecological genetics to plant breeding, practical management of germplasm.

**Realisation and working methods:** Lectures 28, independent study 105 hours

**Study materials and literature:** Relevant

literature will be indicated during the course.

**Evaluation:** Examination 70%, presentation 30%.

**Other information:** The course will be offered in even-numbered years in the spring term.

**Molecular methods in applied plant genetics (JAL403/KBIOT403) 5 credits**  
81037

**Timing:** Recommended to be taken during the fourth or fifth year of studies. Course will be offered in the autumn term, period I.

**Responsible person:** Teemu Teeri

**Objective:** To learn the range of molecular applications available. To understand their principles and the methodology used.

**Contents:** Recent advances in the use of molecular methods in plant and forest tree breeding. Marker-assisted selection, genetic transformation and genomics approaches are discussed in detail. Case studies prepared and presented by the students.

**Realisation and working methods:** Lectures 28, independent study 105 hours

**Study materials and literature:** Relevant literature will be indicated during the course.

**Evaluation:** Examination, case studies.

**Other information:** The course will be offered in even-numbered years in the autumn term.

**Literature in plant and forest tree breeding (JAL502) 10 credits**  
81043

**Responsible person:** Teemu Teeri

**Objective:** To understand the principles, genetic background and applications of plant and forest tree breeding.

**Contents:** Introduction to the theoretical background and applications of plant and forest tree breeding. Selection A in plant breeding, and selection B in forest tree breeding.

**Realisation and working methods:** Independent study

**Study materials and literature:**

Selection A or B:

(A) Plant Breeding

1. Falconer, D.S. and Mackay, T.F.C. 1996. Introduction to quantitative genetics. Longman, 4th Ed.

2. Smart, J. and Simmonds, N.W. (Eds.) 1995. Evolution of crop plants. Longman.

3. Other textbook as agreed..

(B) Forest Tree Breeding

1. Falconer, D.S. and Mackay, T.F.C. 1996.

Department of Applied Biology

Introduction to quantitative genetics.  
Longman, 4th Ed.

2. Fins, L. et al. (Eds.) 1992. Handbook of  
quantitative forest tree improvement.  
Kluwer Academic Publishers.

3. Other textbook as agreed.

**Evaluation:** Examination

**Other information:** The exam can be taken in  
one or two parts.

**Master's Thesis (JAL503) 40 credits**

81052

**Responsible person:** Teemu Teeri

**Contents:** Formulation of a research hypothesis,  
testing of the hypothesis using appropriate  
methodology, analysis of results and their  
interpretation in relation to scientific literature,  
and reporting the study in a thesis and an oral  
presentation.

**Realisation and working methods:**  
Independent study, writing process, Thesis  
groups

**Evaluation:** Grading based on student's own  
input in planning and execution of research, and  
on written research report.

**Breeding of agricultural and horticultural  
crop plants (JAL504) 5 credits**

81045

**Timing:** Recommended to be taken during the  
fourth or fifth year of studies. Course will be  
offered in the autumn term, period I.

**Responsible person:** Teemu Teeri

**Objective:** Familiarization with national and  
international breeding of agricultural and  
horticultural crop plants.

**Contents:** Introduction to the practical breeding  
of agricultural and horticultural plants. Lectures  
by expert breeders. Presentations by students.

**Realisation and working methods:** K 28 - I  
105

**Study materials and literature:** Relevant  
literature will be indicated during the course.

**Evaluation:** Examination (70%), presentation  
(30%).

**Other information:** The course will be offered  
in odd-numbered years in the autumn term.

**Forest tree breeding (JAL505) 5 credits**

81100

**Timing:** Recommended to be taken during the  
fourth or fifth year of studies. Course will be  
offered in the autumn term, period II.

**Responsible person:** Pertti Pulkkinen

**Objective:** To learn current theories and  
practices in forest tree breeding.

**Realisation and working methods:** Lectures  
28, independent study 105 hours

**Study materials and literature:** Relevant  
literature will be indicated during the course.

**Evaluation:** Examination.

**Other information:** The course will be offered  
in even-numbered years in the autumn term.

**Other studies in breeding (JAL506) 2-5  
credits**

81001

**Contents:** Relevant studies, e.g. courses in  
other countries, can be included in the degree.

**Nordic post graduate (NOVA) course in plant  
breeding (JAL601) 5 credits**

81003

**Timing:** Recommended to be taken during  
postgraduate studies. Course will be offered  
during summer terms.

**Responsible person:** Teemu Teeri

**Objective:** To learn modern theories and  
practices in plant breeding, and to meet students  
and teachers in plant breeding internationally.

**Contents:** Determined separately for each  
course.

**Realisation and working methods:** Laboratory  
experiments

**Study materials and literature:** Relevant  
literature will be indicated during the course.

**Evaluation:** Determined separately for each  
course.

**Other information:** The course will be  
organized each summer term in a different  
Nordic country.

**Courses in Finnish**

**Plant Biochemistry and Cell Biology  
(KBIOT200) 3 credits**

81084

**Timing:** Autumn term, period II

**Contents:** Lecture topics include the plant cell  
structure as well as biochemistry, physiology  
and regulation of different plant cell processes  
both at gene and biochemistry level.

**Population and quantitative genetics  
(JAL201) 3-5 credits**

81038

**Contents:** Introduction to theoretical and



molecular population and quantitative genetics. The influence of different factors on the population genetic structures, the nature of genetic variation, and the research methods used. Mathematical exercises.

## Plant Pathology

Plant Pathology is a discipline that examines plant pathogens (fungi, bacteria and viruses) and develops the means for control of plant diseases. Central subjects of studies are plant-pathogen interactions and their influence on plant physiology, resulting either in disease or resistance. These interactions are examined at all biological levels, from molecules to the ecosystem. Studies of plant pathology provide an in-depth understanding of plant pathogens and plant diseases and how various research methods are used for their study. A knowledge of botany, plant physiology, plant production, soil sciences, ecology, genetics, biochemistry and molecular biology is important. The studies also include the biology and ecology of plant pathogens, as well as the spread of diseases and recognition and control of their consequences. Identification of the most harmful plant pathogens in crop production and horticulture takes place using conventional and molecular methods. The aforementioned knowledge lays a foundation for economically and ecologically sustainable plant protection. New pathogens and the variation of existing pathogens constitute a continuous threat to crop production and horticulture that requires development of new and better methods for diagnostics and disease control. Experts in plant pathology are needed in companies working in the agricultural and horticultural sectors, extension and advisory organisations, teaching, administration, research and in various international posts.

### Teaching staff

Academy Professor Jari Valkonen  
University Lecturer Minna Pirhonen  
Amenuensius Hilikka Koponen  
Docent Reijo Karjalainen  
Docent Aarne Kurppa  
Docent Kirsii Lehto  
Docent Andres Merits  
Docent Kristiina Mäkinen

Docent Sari Peltonen  
Docent Elina Roine  
Docent Risto Tahvonen  
Docent Sari Timonen

### Contact information

Department of Applied Biology  
P.O. Box 27  
FIN-00014 University of Helsinki  
Finland  
tel. +358 9 1911  
fax +358 9 191 58 727

## REQUIREMENTS FOR THE MASTER'S DEGREE, 120 CREDITS

### GENERAL STUDIES

KTB402 Research Methodology in the Science of Plant Production, 5 cr  
MIKRO220 Basic Laboratory Course in Microbiology, 5 cr  
BIOT200 Basic Course in Gene Technology, 2 cr  
BIOT201 Laboratory Course in Gene Technology, 3 cr  
Elective studies (at least 10 credits):  
MIKRO200 Basic Course in Microbiology, 5 cr  
Other elective studies  
KTB 411 Personal Study Plan, 1 cr

### MAJOR STUDIES

#### Advanced studies

KPAT401 Epidemiology and Ecology of Plant Pathogens, 5 cr  
KPAT402 Fungal Pathogens of Plants, 5 cr  
KPAT403 Bacteria, Viruses and Pathogen Diagnostics, 10 cr  
KPAT501 Plant-microbe Interactions and Molecular Defence of Plants, 10 cr  
KPAT502 Literature Course in Plant Pathology, 5 cr  
KTB301 Special Training, 3 cr  
KTB501 Seminar, Plant Production, 3 cr  
KPAT503 Master's Thesis, 40 cr  
Maturity Essay

### LANGUAGE STUDIES AND STUDIES IN INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)

ICT studies (1 cr) integrated in KTB501

### OTHER STUDIES, 13 CREDITS

KPAT400 Additional studies in plant pathology or other studies according to Personal Study Plan

## Courses in English

### Teaching events in WebOodi

#### Epidemiology and ecology of plant pathogens (KPAT401/ME460) 5 credits 81331

**Timing:** Autumn term, period I

**Responsible person:** Professor and University Lecturer in Plant Pathology.

**Relations to other study units:** KTB121

**Objective:** To understand the factors and processes behind plant disease epidemics in forest and agricultural ecosystems.

**Contents:** Basic epidemiology and examples. The biological background for epidemics, risk assessment, epidemiological mechanisms, modelling.

**Realisation and working methods:** Lectures 30, practical work 10, group work 0, independent studies 70 hours.

**Study materials and literature:** Wolfe, M.S. & Caten, C.E. eds. 1987. Populations of Plant Pathogens, Their Dynamics and Genetics. Blackwell Scientific Publications. 280 pp. Jones, D. G. (ed.) 1998: The Epidemiology of Plant Diseases. Kluwer Academic Publishers, Dordrecht. Tainter, F.H. & Baker, F.A. 1996. Principles of Forest Pathology. John Wiley & Sons, New York. pp. 237-271. Other relevant literature will be given during the course.

**Evaluation:** Examination

**Other information:** The course will be given in uneven years. Dates, times and other details will be announced at the home page of the Department of Applied Biology and in Oodi.

#### Plant-microbe interactions and molecular defence of plants (KPAT501) 10 credits 81352

**Timing:** Autumn term, period II

**Responsible person:** Professor and university lecturer in Plant Pathology.

**Relations to other study units:** KPAT402, KPAT403

**Objective:** To understand the molecular mechanisms of pathogenesis and virulence in plant pathogens, the molecular basis of symbiotic interactions, and the genetic basis and molecular mechanisms of disease resistance in plants.

**Contents:** The biology of pathogen infections, plant defence responses and symbiotic interactions at the molecular level. The course includes laboratory work sessions.

**Realisation and working methods:** Lectures 60, practical work 50, group work 30,

independent study 30 hours.

**Study materials and literature:** Will be given during the course

**Other information:** The course will be organised jointly and taught simultaneously with the Swedish University of Agricultural Sciences (SLU). For the arrangements, see the course home page: <http://www.mm.helsinki.fi/mmsbl/Kpat/creditspe/index.htm>

#### Additional studies in plant pathology (KPAT400) 81350

**Contents:** Individual courses and lecture series in plant pathology, other than those offered at University of Helsinki, or studies carried out abroad can be credited based on an agreement between the student and the professor.

## Courses in Finnish

#### Fungal pathogens of plants (KPAT402) 5 credits 81304

**Contents:** Taxonomy and biology of fungi infecting plants, especially those prevalent in Finland. Laboratory exercises on identification of fungal pathogens in plant samples.

#### Bacteria, viruses and pathogen diagnostics (KPAT403) 10 credits 81351

**Contents:** Taxonomy and biology of bacteria and viruses infecting plants. Serological, biochemical and molecular methods and in vitro culture techniques for pathogen diagnostics, including laboratory exercises.

#### Literature in plant pathology (KPAT502) 5 credits 81312

**Contents:** Latest knowledge in plant pathology will be studied in a selected subject area based on literature. The student agrees about the literature with the professor and writes a learning diary about it.

#### Master's Thesis (KPAT503) 40 credits 81322

**Contents:** Formulation of a research hypothesis, testing it using appropriate methodology, analysis of results and their interpretation in relation to scientific literature; reporting the study as a thesis and an oral presentation.

## Botany

As Botany is a minor subject in the Faculty of Agriculture and Forestry, only a minor studies module is offered to the students. Study modules on levels A and C were discontinued in 2005. A personal study plan is required and needs consultation with the study advisor. The language of instruction is mainly Finnish. Botany can be studied as a major in the Faculty of Science.

The aim of studies in botany is to give students adequate theoretical and practical knowledge to deal with botanical terminology related to the biology of plants, plant products (also macrofungi) and vegetation, and to support instruction in various fields of applied biology. Agriculture and forestry degree programmes include obligatory studies during the first academic year. These studies highlight the structural and physiological characteristics of plants that are related to the identification of species and functions of the plant body. Advanced studies emphasise the diversity and evolution of reproductive structures and the relationships between species, communities and environments. Studies include practical work.

**Contact information** (during the restoration of C-building in 2006-07):

Offices, A-bldg, 3rd floor, Latokartanonkaari 9  
**Thurman, Tarja**, tel. 191 58381, e-mail: tarja.thurman@helsinki.fi

**Kuokka, Ilpo**, Teacher, student advisor, tel. 191 58420, e-mail: ilpo.kuokka@helsinki.fi

Student herbarium, B-building, floor -1, Latokartanonkaari 7  
**Järvinen, Irma**, tel. 191 58425, e-mail: irma.jarvinen@helsinki.fi

### Minor studies, 25 credits

KASV105 Basics of Botany (plant morphology and identification of plants), 4-5 cr  
52550 Plant Physiology and Plant Anatomy Lectures, 3 cr  
KTB203 Plant Anatomy, 2 cr (in part)  
KTB244 (KASV244) Plant Geography and Ecology, 3 cr  
KASV442 Plant Systematics, 3 cr

KASV432 Course on Macrofungi, 3 cr  
KASV371 Literature Examination in Botany, 2 cr  
Courses in plant biology, 4–5 cr

### Courses in Finnish

**Elementary botany (plant morphology and small identification of plants) (KTB106) 3 credits**  
812076

**Basics of botany (plant morphology and comprehensive identification of plants) (KASV105) 4-6 credits**  
86006  
**Contents:** Structural variation in the plant body, growth process, differentiation of vegetative shoots and tissues, growth forms (Plant morphology lectures). Identification of 355 forest species.

### IDENTIFICATIONS THAT MAY BE CHOSEN TO KASV105:

**Identification of plants in agriculture (KASV451) 3-4 credits**  
86035  
**Contents:** Identification of 378 or 456 species

**Identification of plants in forestry (KASV148) 2 credits**  
86025  
**Contents:** 355 species of forest flora

**Identification of plants in environmental sciences (KASV452) 3 credits**  
86027  
**Contents:** Identification of 393 species

**Identification of aquatic flora (KASV147) 1 credit**  
86020  
**Contents:** 151 species of aquatic flora

**Practicals in plant physiology and anatomy (KTB203) 4 credits**  
812077  
**Timing:** Second year

Department of Applied Biology

**Course on macrofungi i (KASV432) 3 credits**  
86052

**Contents:** Ca. 200 species, collection and presentation of material

**Literature in botany (KASV371) 2-3 credits**  
86005

**STUDIES REQUIRING ADVANCE PASSING OF IDENTIFICATION EXAMINATION:**

**Plant geography and ecology (KTB244/KASV244) 3-4 credits**  
812078

**Timing:** second year or later, autumn term I

**Contents:** climates and thermic processes, circulation of water, nutrients and solids, tolerance and competitiveness of plants, structure, types and regional diversity of vegetation.

**Plant systematics (KASV442) 2-4 credits**  
86001

**Timing:** Spring term, period IV

**Objective:** Structures of steles, sporophylls, flowers, fruits and seeds, economic plants, families and orders of vascular plants.

**Course on vegetation (KASV431) 3-6 credits**  
86050

**Contents:** Field work, principles of sampling and analysis, sites, layers of vegetation, dominants and associates.

**Dendrology of garden plants (KASV434) 3 credits**  
86033

**Contents:** Identification, ecology and success of woods in Finland.

## Organic Food and Farming

The multidisciplinary study programme of Organic Food and Farming is common to all study programmes.

Organic production is an important, officially controlled production system and a sector of food industry that aims at responding to the challenges set by sustainable development. Its

perspective is comprehensive and it covers the whole food chain.

Contact teaching periods that include expert lectures and visits to enterprises and farms are offered mostly in Mikkeli. We use e-learning as a tool for learning on all of our courses. Some of the courses (13 ECTS altogether) are carried out entirely via the internet.

Progressive inquiry- and problem-based learning methods are applied, utilising student-oriented and multidisciplinary team work. Theory and practice are combined with the help of selected business partners. The aim is also to support the students in developing their learning, self-assessment and teamwork skills. Participation in the web course LUOMU0.1 Introduction to Organic Food and Farming is a prerequisite for most of the other courses.

Completion of the study programme in Organic Food and Farming demonstrates that the student is qualified to participate in the critical examination and sustainable development of organic food and farming. It thus prepares students to work particularly in jobs related to the food chain and its support activities where knowledge of organic farming and food industry is required.

The studies are organised by Ruralia Institute's Mikkeli unit at the University of Helsinki. The responsible department within the Faculty of Agriculture and Forestry is the Department of Applied Biology. The course LUOMU2.4 is carried out in cooperation with the Department of Economics and Management. With the studies related to organic animal husbandry both the Department of Animal Science and the professorship of livestock welfare in the Faculty of Veterinary Medicine are involved.

**Responsible professor**

**Helenius, Juha**, Professor, e-mail: juha.helenius@helsinki.fi

**Additional information for students**

**Nupponen, Sirpa**, Study Secretary, e-mail: sirpa.nupponen@helsinki.fi

**Taskinen, Aija**, Study Planner, e-mail: aija.taskinen@helsinki.fi

**Hakala, Harri**, Specialist in Network-based Education, e-mail: harri.hakala@helsinki.fi

**Mynttinen, Ritva**, Study Planner, e-mail: ritva.mynttinen@helsinki.fi

**Other personnel**

**Kujala, Jouni**, Research Director, e-mail: jouni.kujala@helsinki.fi

**Saikkonen, Kari**, Professor, e-mail: kari.saikkonen@mtt.fi

**Seppänen, Laura**, Research Director, e-mail: laura.seppanen@helsinki.fi

**Valros, Anna**, Professor, e-mail: anna.valros@helsinki.fi

**More information:** [www.ecostudies.fi](http://www.ecostudies.fi)

**Basic Studies, 25 credits**

LUOMU0.1 Introduction to Organic Food and Farming, 3 cr

LUOMU1.1 Organic Production Systems, 2 cr

LUOMU2.1 Organic Food Chains, 2 cr

Elective Studies:

LUOMU1.2 Organic Plant Production, 5 cr

LUOMU1.3 Organic Animal Husbandry, 5 cr

LUOMU2.2 Social and Economic Aspects of Organic Food and Farming, 3 cr

LUOMU2.3 Organic Food Processing and Organic Food, 5 cr

LUOMU2.4 Basic course in Marketing Organic Foodstuffs, 5 cr

LUOMU3 Basic Literature on Organic Food and Farming, 1–6 cr

LUOMU4 Practical Training, 3 cr

Other elective studies 1-5 cr

The elective studies are to be agreed with Prof. Helenius. It is recommended that both LUOMU1.2 and LUOMU1.3 are chosen.

**Intermediate Studies, 60 credits**

Basic Studies, 25 credits

LUOMU5 Organic Quality, 8 cr

LUOMU6 Organic Food Systems, 8 cr

LUOMU7 Case Study, 8 cr

Elective Studies:

LUOMU8 Literature for Intermediate Studies in Organic Food and Farming, 3-9 cr

LUOMU9 Work in a Research Group, 3 cr

LUOMU10 Study Projects in Organic Food and Farming, 2-8 cr

LUOMU11 Livestock Welfare and Special Topics in Organic Animal Husbandry, 8 cr

LUOMU12 Current Questions in Organic Plant Production, 8 cr

Other elective studies, 1-5 cr

The elective studies are to be agreed with Prof. Helenius.

**Courses in English**

**Teaching events in WebOodi**

**Basic Literature on Organic Food and Farming (LUOMU3) 1-6 credits**

812042

**Timing:** Examinations monthly

**Responsible person:** Aija Taskinen

**Objective:** Students are encouraged to extend their knowledge of the topics contained in the basic study module according to their own interests.

**Contents:** Sustainability of organic food and farming systems, organic animal husbandry, organic plant production, organic food and markets.

**Realisation and working methods:** lectures 0 h - practical work 0 h - group work 0 h - independent study 27-160 h

**Study materials and literature:** Course literature folder.

**Evaluation:** Examination and/or discursive book review.

**Other information:** The course makes use of the WebCT learning environment. Arrangements can be made to include texts of the student's own choice.

**Practical Training (LUOMU4) 3 credits**

812043

**Timing:** To be agreed with the responsible person

**Responsible person:** Aija Taskinen

**Relations to other study units:** LUOMU0.1 required

**Objective:** To give students the opportunity to apply their theoretical studies in practice.

**Contents:** Practical training for 40 working days on an organic farm, in a company producing organic foodstuffs, in an organization working in the field of organic food and farming, or in public administration, followed by the writing of a report discussing the experiences gained.

**Evaluation:** Submission of a report for approval.

**Other information:** Practical arrangements with the training organisation made by the student and accepted by the responsible person beforehand.

**Organic Quality (LUOMU5) 8 credits**  
812044

**Timing:** Autumn term, period I, contact teaching period in Viikki week 38. Offered every other year, in even-numbered years.

**Responsible person:** Dr. Kujala, other lecturers

**Relations to other study units:** Basic studies in organic food and farming required or corresponding studies as agreed.

**Objective:** Organic food and farming are approached from the viewpoint of the demand chain and as an issue of consumption. The course concentrates on quality issues in organic production and offers means for working on these aspects. The students will learn to understand quality as a comprehensive concept and the background to consumers' food choices in general and their choices of organic food in particular. The students will familiarize themselves with special issues and challenges for the development of the organic food sector.

**Contents:** A comprehensive approach to food quality: the comprehensive concept of quality, ethical quality, social and ecological quality. Product properties: nutritional, technical and aesthetic quality; food safety. Experiencing, assessing and communicating quality: experiencing quality and the values connected with it, measuring quality; quality strategies and systems, transparent value-added chains and sustainable pricing policies.

**Realisation and working methods:** lectures 35 h, practical work 0 h, group work 40 h, independent study 139 h

**Study materials and literature:** Finnish and international literature on organic quality issues, selected articles

**Evaluation:** Written report, exercises

**Other information:** [www.ecostudies.fi](http://www.ecostudies.fi).

**Organic Food Systems (LUOMU6) 8 credits**  
812045

**Timing:** Spring term 2008, period III, offered every other year, in even-numbered years.

**Responsible person:** Prof. Helenius, Dr. Kujala, lecturers.

**Relations to other study units:** Basic studies in organic food and farming required or corresponding studies as agreed. The course is offered jointly with AEKO501 Sustainable Agri-Food Systems, please see also Objectives and Contents of that course. Lectures will mostly be held in Viikki. The course includes a contact teaching period in the Mikkeli campus concentrating on organic food systems (see objective and contents below).

**Objective:** The course examines organic production from a social and ecological perspective. Students are introduced to the multifunctionality of food systems. They will learn to recognize various food system models and to make critical assessments of these systems and of their prospects for sustainability and development.

**Contents:** A food system as a framework for organic production, sustainability of food systems, sustainability of food systems in a global perspective. Food systems analysis: familiarization with a real food system model in a multidisciplinary student team. The team will produce an analysis of the functions and sustainability of the food system and a well-grounded proposal for its further development.

**Realisation and working methods:** lectures 55 h, practical work 0, group work 30, independent study 129 h.

**Study materials and literature:** Finnish and international literature on food systems, selected articles

**Evaluation:** Examination (70 %) and food system analysis (30 %).

**Case Study (LUOMU7) 8 credits**  
812046

**Timing:** Spring term 2008, period IV, offered every other year, in even-numbered years.

**Responsible person:** Dr. Kujala, Professor Valros, Dr. Seppänen, other lecturers.

**Relations to other study units:** Basic studies in organic food and farming required or corresponding studies as agreed. LUOMU6/AEKO501 required.

**Objective:** A multidisciplinary team of 3 to 4 students will concentrate on a real-life problem or development challenge concerned with organic food and farming or organic food systems. A systems approach will be employed in this tutored research work. In addition to strengthening students' abilities to develop organic food systems, the course aims to give

them tools for interdisciplinary research work, problem definition, literature searches, analysis and synthesis, and presentation of the results in the form of a collective report.

**Contents:** Special challenges and methodology for research on organic agri-food systems, making a research plan, implementation of the research, interpretation and synthesis of the results, preparation of a report.

**Realisation and working methods:** lectures 20 h, practical work 0 h, group work 20 h, independent study 174 h

**Study materials and literature:** Methodological literature, applicable literature acquired by the team.

**Evaluation:** Research plan and report, participation in group meetings, oral presentation, self and peer assessment in groups (opponents).

**Literature for Intermediate Studies in Organic Food and Farming (LUOMU8) 3-9 credits**  
812047

**Timing:** To be agreed with the responsible person

**Responsible person:** Dr. Kujala

**Relations to other study units:** Basic study module in organic food and farming required or others by agreement.

**Objective:** To deepen the knowledge of topics of particular interest arising from the intermediate study module.

**Contents:** The literature is divided to teaching and advisory activities, entrepreneurship, research and society sections.

**Realisation and working methods:** lectures 0 h - practical work 0 h - group work 0 h - independent study 80-240 h

**Study materials and literature:** Literature to be determined individually on the basis of a bibliography available from the responsible person.

**Evaluation:** Examination and/or discursive book review.

**Work in a Research Group (LUOMU9) 3 credits**  
812048

**Timing:** To be agreed with the responsible person

**Responsible person:** Dr. Kujala

**Relations to other study units:** Basic study module in organic food and farming required; other preliminary studies may be accepted.

**Objective:** An opportunity to apply the theoretical organic food and farming studies in an expert community.

**Contents:** Students will spend 40 working days familiarizing themselves with research on organic food and farming and the methods used in this research, followed by the writing of a report on the work done or experiences gained.

**Evaluation:** Submission of a report for approval.

**Other information:** Arrangements will be made jointly by the student and by the responsible person.

**Study Projects in Organic Food and Farming (LUOMU10) 2-8 credits**

812052

**Timing:** To be agreed with the responsible person.

**Responsible person:** Dr. Kujala

**Relations to other study units:** LUOMU0.1 required

**Evaluation:** Submission of a report for approval

**Other information:** Credits may be awarded for other study courses or modules connected with or supporting those in organic farming and foodstuffs, e.g. membership in study groups, separate series of lectures or seminars, followed by the writing of a report. Agreement should be reached with the teacher responsible on the validity of the suggested studies and number of credits to be awarded before commencement of the studies.

**Current Questions in Organic Plant Production (LUOMU12) 8 credits**

812102

**Timing:** Autumn term, I-II periods. The course is intended especially for students who are preparing a thesis or other research and know the basics of organic plant production.

**Responsible person:** Professor Helenius, Professor Saikkonen

**Relations to other study units:** LUOMU0.1, LUOMU1.1, LUOMU1.2 required or other corresponding studies as agreed.

**Objective:** The study module takes up current questions in organic plant production and examines the latest research results in the area. It strengthens the ability to do scientific research, especially in the field of organic plant production. The student takes a view of organic plant production and its research needs. The

module provides the students with an opportunity to further thesis work concerned with organic plant production. If the student is not writing a thesis, the research skills are practiced by doing exercises on given themes. Student considers his/her professional goals and searches for his/her role in the multidisciplinary field of organic food and farming. The lectures also introduce future employment options dealing particularly with organic plant production.

**Contents:** Discussion and topical research results in organic plant production, focusing on following themes: ecological approaches to plant production; soil ecology; ecological plant protection, plant breeding and propagation; energy use and sources and the possibilities of using renewable energy at a plant production farm; future prospects. Lectures and exercises on research of organic plant production: Present state, characteristics and methods of organic plant production research; phases of research project; choosing the research topic; funding sources and procedures; factors affecting funding decisions; writing a CV, a funding application and a research plan; the importance of publication. This content will be connected to issues of organic plant production. Employment options and skills needed in the field of organic plant production.

**Realisation and working methods:** Lectures 75, practical work 0, group work 0, independent study 139 hours

**Study materials and literature:** Current scientific literature as instructed.

**Evaluation:** Attendance, active participation (lectures, on-line discussions), exercises.

**Other information:** [www.ecostudies.fi](http://www.ecostudies.fi).

## Courses in Finnish

### Introduction to Organic Food and Farming (LUOMU0.1) 3 credits

812101

**Timing:** Autumn term, period II and spring term, period IV; Web course.

**Contents:** Organic food and farming are approached by examining the problems of sustainable development, the concept of sustainability, various understandings of nature, visions of the future, the public debate over organic food and farming, interpretations and perspectives regarding organic production and objectives for the development of production

and food supply systems. Students will also be made familiar with the history and current state of organic food and farming and will visit an organic farm. The course is designed both to stand independently and to serve as a basis for other parts of the study module.

### Organic Production Systems (LUOMU1.1) 2 credits

812065

**Timing:** Autumn term, periods I and II; Web course.

**Contents:** Cooperation between farms and at the regional level, the farm as an operational system, farm entities and their analysis.

### Organic Plant Production (LUOMU1.2) 5 credits

812066

**Timing:** Autumn term 2006, period I

**Contents:** Ecological foundations of organic cultivation, functioning of the field ecosystem, crop rotation, nutrient supplies and soil fertility, plant protection, supplementary materials.

### Organic Animal Husbandry (LUOMU1.3) 5 credits

812067

**Timing:** Autumn term 2006, period II

**Contents:** Livestock behaviour, species management and welfare, breeding, feeding and fodder.

### Organic Food Chains (LUOMU2.1) 2 credits

812068

**Timing:** Spring term, period III; Web course.

**Contents:** Food chains from the field to the table, food chains in food systems.

### Social and Economic Aspects of Organic Food and Farming (LUOMU2.2) 3 credits

812069

**Timing:** Spring term, period III

**Contents:** Company and community economic perspectives, the political dimension of organic production, markets for organic produce, entrepreneurship.

### Organic Food and Manufacture of Organic Foodstuffs (LUOMU2.3) 5 credits

812070

**Timing:** Spring term, period III

**Contents:** Quality requirements for raw materials, product and process development,



manufacturing and packaging technology, eco-efficiency in manufacturing, regulations governing organic foodstuffs and their supervision. Quality and safety, sustainability of an organic diet and organic food culture.

**Basic Course in Marketing Organic Foodstuffs (LUOMU2.4) 5 credits**

812100

**Timing:** Spring term, period IV

**Contents:** Essential terms of marketing and competitive methods of marketing and planning. The course takes into account special characteristics of organic food which need to be taken into consideration while planning marketing.

**Livestock Welfare and Special Topics in Organic Animal Husbandry (LUOMU11) 8 credits**

90380

**Timing:** Autumn period

**Contents:** Animal politics, animal ethics, organisations working with protection of animals, legislation concerning protection of animals, preventive health care, welfare measurement.

## DEPARTMENT OF APPLIED CHEMISTRY AND MICROBIOLOGY

The Department of Applied Chemistry and Microbiology has chairs in agricultural chemistry and physics, soil and environmental chemistry, environmental biotechnology, food chemistry, microbiology and nutrition. The Division of General Chemistry has chairs in both chemistry and biochemistry and offers courses in these subjects to students of the entire Faculty of Agriculture and Forestry. The Department currently has approximately 200 undergraduate and 60 postgraduate students. Annually, 30-40 students complete the Master's degree and about 5-10 complete a postgraduate degree.

### Head of the department

Professor Maija Tenkanen (until December 31, 2006).

### Contact information

Department of Applied Chemistry and Microbiology  
P.O. Box 27  
FIN-00014 University of Helsinki  
Finland  
tel. +358 9 1911  
fax +358 9 191 58 475

### Courses in Finnish

#### Introduction to University studies (MMKEM100) 5 credits

871055

**Contents:** Introductory lectures on studies and research at the department and information on the facilities of the campus. Working in small groups, preparing and presenting a project work of a selected subject, and preparing a personal study plan for the first year.

#### HOPS- Updating your personal study plan (MMKEM200) 1 credit

871056

**Contents:** To update and revise a personal study plan for further BSc studies.

#### Environment and developing countries - from biology to economics (MMKEM250) 4 credits

871054

## Environmental Soil Science

Environmental soil science focuses on soil processes and phenomena. The interactions of soil with plants, watercourses and air are studied as chemical, physical and biological processes. We concentrate on mechanisms that control the reactions and impacts of native and anthropogenic substances on the functions of ecosystems in soil and sediment.

The studies include, for example, characterisation and roles of different soil components, including the solid phase, water and soil air. The reactions of various solutes, such as fertilizers, pesticides and different organic and inorganic harmful substances, and their transport from soil to plants, watercourses and atmosphere are investigated. The objective of the studies is to gain a thorough understanding of how soil processes can be utilized to achieve sustainable plant production, to prevent environmental problems and to remediate deteriorated sites. All students pursue basic studies in chemistry and in the principles of other basic sciences. Thereafter the students specialise in soil chemistry, soil physics or plant nutrition. This specialisation can be further supported by taking related courses in other disciplines. Those who include certain courses in agriculture in the Master's degree of Environmental Soil Science are also entitled to use the title of agronomist (in Finnish: agronomi).

### Teaching staff

Professor Helinä Hartikainen, email [helina.hartikainen@helsinki.fi](mailto:helina.hartikainen@helsinki.fi)  
Professor (acting) Markku Yli-Halla, email [markku.yli-halla@helsinki.fi](mailto:markku.yli-halla@helsinki.fi)  
University Lecturer Asko Simojoki (Student Advisor), email [asko.simojoki@helsinki.fi](mailto:asko.simojoki@helsinki.fi)

### Contact information

Environmental Soil Science  
P.O. Box 27, (Viikki, Latokartanonkaari 11)  
FIN-00014 University of Helsinki  
Finland  
tel. +358-9-1911  
fax +358-9-191 58 475  
Internet: <http://mm.helsinki.fi/mmkem/maa>

### REQUIREMENTS FOR THE BACHELOR'S DEGREE, 180 CREDITS

#### GENERAL STUDIES

Y120 Orientation to Studies, 0-1 cr  
MMKEM100 Introduction to University Studies, 5 cr  
Y96 Demonstration of Proficiency in High School Mathematics, 0 cr  
YFYS1 Physics I, 5 cr  
Y130 Basics of Statistical Inference, 5 cr  
YMPS101 Basic Lectures in Environmental Science, 5 cr  
MIKRO200 Basic Course in Microbiology, 5 cr  
MIKRO220 Basic Laboratory Course in Microbiology, 5 cr  
Plant Physiology, 3 cr  
MMKEM200 HOPS- Updating Your Personal Study Plan, 1 cr

#### MAJOR STUDIES

##### Basic studies

MAA200 Principles of Soil Science, 5 cr  
MAA240 Plant Nutrition, 5 cr  
MAA250 Soil Structure, 5 cr  
MAA255 Soils and Environment, 5 cr  
MAA270 Readings I, 5 cr

##### Intermediate studies

MAA300 Advanced Course in Soil Science, 5 cr  
MAA350 Soil Hydrology, 5 cr  
MAA330 Producing and Utilising Information in Soil Science, 5 cr  
MAA360 Laboratory Practical I, 10 cr  
MAA370 Readings II, 10 cr  
MAA380 Bachelor's Seminar, 4 cr  
MAA390 Bachelor's Thesis, 6 cr  
Maturity Essay

#### LANGUAGE STUDIES AND STUDIES IN INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)

Second domestic language, 4 cr  
Foreign language, 3 cr  
ICT driving licence, 3 cr

#### MINOR STUDIES

Minor subject, free-choice, 25 credits  
Basic studies in Chemistry, 25 credits  
YKEM100 Chemistry, Lectures, 8 cr

Department of Applied Chemistry and Microbiology

YKEM101 Chemistry, Laboratory Course, 5 cr  
YKEM110 Physical Chemistry, Lectures, 6 cr  
YKEM200 Applied Organic Chemistry, 6 cr

#### FREE-CHOICE STUDIES, 15-16 CREDITS

#### REQUIREMENTS FOR THE MASTER'S DEGREE, 120 CREDITS

##### GENERAL STUDIES

Y131 Statistical Models 1, 5 cr

##### MAJOR STUDIES

###### Advanced studies

MAA505 Special Practical Training, 2 cr  
MAA560 Laboratory Practical II, 10 cr  
MAA580 Master's Seminar, 3 cr  
MAA570 Readings III, 10 cr  
MAA590 Master's Thesis, 40 cr  
Maturity Essay  
At least 10 credits from the following courses:  
MAA540 Advanced Course in Plant Nutrition, 5 cr  
MAA550 Research Methods of Soil Physics, 5 cr  
MAA555 Soil Chemistry of Organic Chemicals, 5 cr  
ME310 Soil Formation and Classification, 5 cr

#### OTHER STUDIES, 30 CREDITS

#### FREE-CHOICE STUDIES, 10 CREDITS

##### Courses in English

###### Teaching events in WebOodi

##### Readings I (MAA270) 5 credits

817834

**Timing:** Certain examination dates in all semesters

**Responsible person:** Professor Markku Yli-Halla

**Relations to other study units:** Basic knowledge of chemistry

**Objective:** Understanding the principles of soil science and plant nutrition

**Contents:** Written + oral examination

**Study materials and literature:** N.C. Brady & R.R. Weil: The Nature and Properties of Soils.

13. Ed. 960 p. Prentice Hall, 2002.

**Other information:** By passing this literature examination non-Finnish speaking students who have sufficient knowledge of chemistry become eligible to enrol in the Laboratory Practicals of Environmental Soil Science.

##### Laboratory practical I a (MAA265) 5 credits 817860

**Timing:** Spring term, Period III

**Responsible person:** University Lecturer

**Relations to other study units:** Lectures and laboratory practicals of chemistry (YKEM100, YKEM101) and Principles of Soil Science (MAA200, MAA270), or corresponding knowledge.

**Objective:** Principles of analytical methods and equipment used in agricultural, environmental and food sciences.

**Contents:** Safety issues of laboratory work. Inorganic analyses of soil, plant and water samples. Written report of the analyses and their results.

**Study materials and literature:** 1) Laboratory manual and 2) parts of L.P. van Reeuwijk (ed.): Procedures for soil analysis. 6. ed. Technical paper 9. ISRIC, Wageningen, The Netherlands.

**Evaluation:** Evaluation of the report. Written examination.

**Other information:** If foreign students are enrolled, the language of instruction is English; otherwise Finnish. This short course is offered concurrently with the more comprehensive Laboratory Practicals (MAA360). Enrolment in MAA265 is limited. Contact the student advisor for further information.

##### Laboratory practical I (MAA360) 10 credits 817838

**Timing:** Spring term, Period III

**Relations to other study units:** Lectures and laboratory practicals of chemistry (YKEM100, YKEM101) and Principles of Soil Science (MAA200 or MAA270), or corresponding knowledge.

**Objective:** Comprehensive command of analytical methods and equipment used in agricultural, environmental and food sciences.

**Contents:** Safety issues of laboratory work. Inorganic analyses of soil, plant and water samples. The analyses include, among others, the determination of pH and electrical conductivity of soil, soil organic carbon content and particle size distribution, cation exchange

capacity, water retention properties of soil, contents of soil and plant material, and basic water analysis. Written report of the analyses and their results.

**Study materials and literature:** 1) Laboratory manual and 2) L.P. van Reeuwijk (ed.): Procedures for soil analysis. 6. ed. Technical paper 9. ISRIC, Wageningen, The Netherlands.

**Evaluation:** Evaluation of the report. Written examination.

**Other information:** If foreign students are enrolled, the language of instruction is English; otherwise Finnish. The number of participants taking MAA360 is limited. Contact the student advisor for further information.

## Courses in Finnish

### Principles of soil science (MAA200) 5 credits

817830

**Contents:** Introduction to soil formation in Finland and to the basic chemical, physical, and biological properties of soil.

### Plant nutrition (MAA240) 5 credits

817831

**Contents:** Knowledge of factors affecting plant growth and principles of plant nutrition.

### Soil structure (MAA250) 5 credits

817832

**Contents:** Knowledge of soil structure formation and changes in relation to different soil management systems. Emphasis on the influence of soil tillage upon soil physical properties and processes, plant productivity and the quality of the environment. Includes laboratory sessions.

### Soils and environment (MAA255) 5 credits

817833

**Objective:** Study of the properties of various elements and compounds and their common reactions in soil, sediment, watercourses, and air.

### Advanced course in soil science (MAA300) 5 credits

817835

**Contents:** The chemical properties of inorganic and organic soil components and their significance for the properties of soil.

The interaction of chemical, physical and biological properties and soil formation are also discussed.

### Producing and utilising information in soil science (MAA330) 5 credits

817837

### Soil hydrology (MAA350) 5 credits

817836

**Contents:** The properties of water in relation to porous media, the flow of water in saturated and unsaturated soil, the movement of solutes, and the field water cycle. Laboratory sessions included.

### Readings II (MAA370) 10 credits

817839

**Timing:** Certain examination dates in all semesters

### Bachelor's seminar (MAA380) 4 credits

817841

### Bachelor's thesis (MAA390) 6 credits

817840

### Special practical training (MAA505) 2 credits

817845

### Advanced course in plant nutrition (MAA540) 5 credits

817842

### Research methods of soil physics (MAA550) 5 credits

817843

**Contents:** Integration of theories and equations employed in soil physics with plant productivity and the quality of the environment; taught in collaboration with soil scientists working on their research problems. Includes laboratory sessions.

### Soil chemistry of organic chemicals (MAA555) 5 credits

817844

**Contents:** Theoretical basis of reactions and mobility of organic chemicals in soil, sediment and water.

### Laboratory practical II (MAA560) 10 credits

817846

**Readings III (MAA570) 10 credits**

817848

**Objective:** Readings on theories and their application to practical issues leading to a thorough understanding of matters pertaining to soil science, plant nutrition and environmental chemistry.

**Master's seminar (MAA580) 3 credits**

817847

**Master's thesis (MAA590) 40 credits**

817849

**Writing a scientific paper (MAA610) 3-15 credits**

817850

**Contents:** Exercise in utilising the literature and in writing scientific reports.

**Optional readings in advanced studies (MAA620) 3-6 credits**

817851

**Tutored research (MAA630) 2-7 credits**

817852

**Study team (MAA640) 1-3 credits**

817853

## Food Chemistry

The main educational objective of food chemistry is to teach and study the composition, structures, reactions and analysis of foods and their components on the basis of organic and analytical chemistry and biochemistry. Food safety and control is also one important field in food chemistry. Food chemists are usually employed by the food industry or by food chemical, agricultural or environmental research and control laboratories and also as teachers either in Finland or abroad. Their specialities are analytics, quality control, product development, research and information services. The main research subjects are chemistry and the analysis of nutrients and other health-related substances as well as of lipid oxidation and natural antioxidants.

**Teaching staff**

Professor Vieno Piironen  
Professor Marina Heinonen  
University Lecturer Riitta Kivikari  
University Lecturer Anna-Maija Lampi  
University Lecturer Velimatti Ollilainen

**Contact information**

Department of Applied Chemistry and Microbiology/Food Chemistry  
P.O. Box 27  
FIN-00014 University of Helsinki  
Finland  
tel. +358 9 1911  
fax +358 9 191 58 475

Internet: [http://www.mm.helsinki.fi/MMKEM/ek/index\\_english.htm](http://www.mm.helsinki.fi/MMKEM/ek/index_english.htm)

### REQUIREMENTS FOR THE BACHELOR'S DEGREE, 180 CREDITS

**GENERAL STUDIES**

Y120 Orientation to Studies, 0-1 cr  
MMKEM100 Introduction to University Studies, 5 cr  
Y96 Demonstration of Proficiency in High School Mathematics, 0 cr  
YFYS1 Physics I, 5 cr  
Y130 Basics of Statistical Inference, 5 cr  
MMKEM200 HOPS - Updating Your Personal Study Plan, 1 cr

**MAJOR STUDIES**

Basic studies

ETT130 Principles of Food Technology, 10 cr  
EK110 Basics of Food Chemistry, 3 cr  
MIKRO200 Basic Course in Microbiology, 5 cr  
RAV090 Introduction to Nutritional Science, 4 cr

Elective Studies in Food Science, 3 cr

Intermediate studies

EK120 Chemical Analysis, 3 cr  
EK125 Basics of Food Analysis, 5 cr  
EK211 Carbohydrates, 3 cr  
EK212 Proteins, 3 cr  
EK213 Lipids, 3 cr

EK215	Macromolecules in Foods: Concluding Project, 1 cr
EK130	Food Safety and Control, 5 cr
EK240	Scientific Communication, 4 cr
EK245	Bachelor's Thesis, 6 cr Maturity Essay

At least 10 credits from the following or optional courses:

EK221	Vitamins and Other Bioactive Compounds, 5 cr
EK222	Food Enzymes, 3 cr
EK223	Food Additives, 3 cr
EK224	Functional Foods and Novel Foods, 5 cr
EK225	Introduction to Food-based Hypersensitivity, 2 cr
YKEM310	Bioinorganic Chemistry, 3 cr
ETT225	Physical Chemistry of Foods, 5 cr

#### LANGUAGE STUDIES AND STUDIES IN INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)

Second domestic language, 4 cr  
Foreign language, 3 cr  
ICT driving licence, 3 cr

#### OTHER STUDIES

EK230	Orientation to the Labour Market, 1 cr
MIKRO575	Food and Environmental Hygiene and Control, 5 cr
BKEM100	Biochemistry I, 5 cr
BKEM101	Biochemistry Basic Principles, Laboratory Course, 5 cr
MIKRO220	Basic Laboratory Course in Microbiology, 5 cr
YKEM111	Physical Chemistry, Laboratory Course 3 cr

#### MINOR STUDIES

Basic studies in Chemistry, 25 credits  
YKEM100 Chemistry, Lectures, 8 cr  
YKEM101 Chemistry, Laboratory Course, 5 cr  
YKEM110 Physical Chemistry, Lectures, 6 cr  
YKEM200 Applied Organic Chemistry, 6 cr  
Second minor subject, 25 credits  
Can be chosen freely

#### FREE-CHOICE STUDIES, 12 CREDITS

### REQUIREMENTS FOR THE MASTER'S DEGREE, 120 CREDITS

#### MAJOR STUDIES

##### Advanced studies

EK322	Laboratory quality assurance, 5 cr
	Elective studies of analysis, 5 cr
EK331	Research methods, 8 cr
EK310	Exam in food chemistry, 8 cr
EK355	Seminars, 3 cr
EK360	Advanced literature, 5 cr
	Elective studies in Food chemistry, 6 cr
EK350	Master's Thesis, 40 cr
	Maturity essay

#### LANGUAGE STUDIES AND STUDIES IN INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)

EK321	Food chemistry research, 3 cr
-------	-------------------------------

#### OTHER STUDIES

YKEM210	Spectrometry, Lectures, 3 cr
YKEM220	Chromatography, Lectures, 3 cr
YKEM211	Organic Structural Analysis, 4 cr
EK340	Research Training, 1 cr
EK300	Personal Study Plan for M.Sc., 1 cr
	Elective studies, either a minor subject or other specialised studies, 25 cr

### Courses in Finnish

#### Basics of food chemistry (EK110) 3 credits

87150

**Contents:** Chemical structures and the most important properties and reactions of food components.

#### Chemical analysis (EK120) 3 credits

87154

**Contents:** The basics of the analytical methods and instrumentation, laboratory quality assurance and general quality standards. The course includes also sampling, validation of analytical methods and evaluation of result reliability.

#### Basics of food analysis (EK125) 5 credits

87153

**Contents:** This is a six week long course that combines laboratory work and lectures. Basic chemical food analysis are carried out in the laboratory. Lectures cover the theory of the analyses.

**Food safety and control (EK130) 5 credits**

871058

**Timing:** Autumn term, I & II period

**Contents:** Initiates students into risk assessment of chemical factors in foods, role of food authorities and regulations.

**Carbohydrates (EK211) 3 credits**

87142

**Timing:** Spring term, III period

**Contents:** Chemical structures and reactions of food carbohydrates. Special emphasis on Maillard reaction. Effects on technological, nutritional and sensory properties and safety of foods.

**Proteins (EK212) 3 credits**

87143

**Timing:** Spring term, IV period

**Contents:** Chemical structures of amino acids and proteins, the chemical reactions and technological properties of amino acids and proteins.

**Lipids (EK213) 3 credits**

87144

**Timing:** Autumn term, I period

**Contents:** Chemical structures and reactions of food lipids. Special emphasis on lipid oxidation. Effects on technological, nutritional and sensory properties and safety of foods.

**Macromolecules in foods: concluding project (EK215) 1 credit**

871057

**Contents:** An essay on the effects and interactions of macromolecules in a certain food application is written.

**Vitamins and other bioactive compounds (EK221) 5 credits**

87145

**Contents:** Chemical and biochemical properties, modes of action (bioactivities) and analytical methods of vitamins and other bioactive compounds including carotenoids, flavonoids and phenolic acids, phytoestrogens, purines and phytosterols

**Food enzymes (EK222) 3 credits**

87146

**Timing:** Autumn term, II period

**Contents:** Properties of food enzymes, principles of enzymatic catalysis, enzyme

engineering, enzyme production, industrial enzymes, applications in food industry, legislation.

**Food additives (EK223) 3 credits**

87148

**Timing:** Autumn term, II period

**Contents:** Chemical properties, functional properties, legislation, safety evaluation, estimation of intake.

**Functional foods and novel foods (EK224) 5 credits**

87137

**Timing:** Autumn term, I and II period

**Contents:** The total concept of functional foods and novel foods including their definition, legislation, labelling, marketing, necessity, the bioactivity of functional ingredients and the health claim, and the safety of novel foods and genetically modified foods.

**Hypersensitivity related to food (EK225) 2 credits**

871065

**Timing:** Autumn term

**Contents:** Describes the basics of hypersensitivity to certain food components; reactions and factors affecting it.

**Orientation to labour market (EK230) 1 credit**

871061

**Contents:** Orientation to the labour market. A one-day seminar including an excursion.

**Scientific communication (EK240) 4 credits**

871059

**Contents:** Oral and written communication in science. Finnish language in scientific writing. Ethical questions. Orientation towards writing a bachelor's thesis. Presentations in a seminar.

**Bachelor's thesis (EK245) 6 credits**

871060

**Contents:** Writing of a scientific report on a given topic.

**Personal study plan for MSc (EK300) 1 credit**

871064

**Objective:** To set a personal study plan for MSc studies.



**Exam in food chemistry (EK310) 8 credits**

87131

**Contents:** The examination covers the most important food components (water, carbohydrates, lipids, proteins, enzymes, vitamins, minerals, pigments, aroma compounds, additives, toxic compounds) as well as plant and animal-based food raw materials.

**Food chemistry research (EK321) 3 credits**

871062

**Contents:** Planning of a research project and writing a research plan. Research funding. Research in food sciences in Finland. Ethical questions. Orientation for a master's thesis.

**Laboratory quality assurance (EK322) 5 credits**

871063

**Timing:** Spring term, IV period

**Contents:** Familiarizes students with quality assurance in a laboratory, quality norms and standards, validation of an analytical method, evaluation of the correctness of measurements and experimental design. Computer-assisted course.

**Research methods (EK331) 8 credits**

87163

**Contents:** The course consists of four extensive laboratory exercises including report writing.

**Research Training (EK340) 1 credit**

87176

**Contents:** A 12-weeks practical working in a food sector laboratory.

**Master's thesis (EK350) 40 credits**

87174

**Seminars (EK355) 3 credits**

87172

**Contents:** Participation in 12 seminar sessions, presenting two seminars based on student's own master's thesis, and acting as an opponent.

**Advanced literature (EK360) 5 credits**

87175

**Contents:** To strengthen knowledge of a selected field/topic. An examination on food chemical literature of choice.

**Postgraduate studies in food chemistry (EK410)**

87180

**Postgraduate studies, examination on literature of choice (EK420)**

87135

**Project Work in Food Chemistry (EK136) 1 credit**

87129

**Contents:** Participation in the research projects or teaching activities of the food chemistry division.

## Microbiology

The courses and the research activity in microbiology are directed towards applied microbiology, i.e. understanding the benefits and risks that microbes pose to agriculture and forestry, the pulp and paper industry, food industry and environmental biotechnology. Microbiology offers a specialisation in Environmental Biotechnology. The Bachelor's degree in Microbiology may be completed within three years, and the Master's degree within five years. Graduated microbiologists are employed mainly in research and administrative sectors, as well as in the food, food processing, medical, brewing and dairy industries.

### Teaching staff

Mirja Salkinoja-Salonen, Professor  
Per Saris, Professor of Food Microbiology  
Annele Hatakka, Professor of Environmental Biotechnology  
Kristina Lindström, University Lecturer  
Taina Lundell, University Lecturer  
Sari Timonen, University Lecturer  
Pauliina Lankinen, Post-doctoral Assistant (Student Adviser)

### Contact information

Division of Microbiology  
P.O. Box 56 (Viikinkaari 9)  
FIN-00014 University of Helsinki  
Finland  
tel. +358 9 1911  
fax +358 9 191 59 322  
Internet: <http://www.mm.helsinki.fi/mmkem/mikro/>

### REQUIREMENTS FOR THE BACHELOR'S DEGREE, 180 CREDITS

#### GENERAL STUDIES

MMKEM100 Introduction to University Studies, 5 cr  
Y96 Demonstration of proficiency in high school mathematics, 0 cr  
Y100 Mathematics 1, 5 cr  
Y130 Basics of statistical inference, 5 cr  
YFYS1 Physics 1, 5 cr  
Y10 Computer Science 2, 3 cr

MAA200 Principles of Soil Science, 5 cr  
MMKEM200 HOPS - Updating your personal study plan, 1 cr

### MAJOR STUDIES

#### Basic Studies

MIKRO200 Basic Course in Microbiology, 5 cr  
MIKRO210 Basic Seminar in Microbiology (MIKRO210), 5 cr  
MIKRO220 Basic Laboratory Course in Microbiology, 5 cr  
MIKRO231 Food Microbiology, 5 cr  
MIKRO241 Environmental Microbiology, 5 cr

#### Intermediate Studies

MIKRO 232 Food Microbiology, Laboratory practicals, 5 cr  
MIKRO242 Environmental Microbiology, Laboratory practicals, 5 cr  
MIKRO401 Introduction to Employment for Microbiologists, 1 cr  
MIKRO450 Intermediate Level Examination, 10 cr  
MIKRO480 Bachelor's Seminar, 4 cr  
MIKRO490 Bachelor's Thesis, 6 cr  
Maturity Essay

Elective Studies in Microbiology, Biotechnology and Genetics 15 cr

### OTHER STUDIES

BKEM100 Biochemistry, 5 cr  
BKEM101 Biochemistry Basic Principles, Laboratory Course, 5 cr  
BIOT200 Basic Course in Gene Technology, 2 cr,  
BIOT201 Laboratory Course In Gene Technology, 3 cr

### LANGUAGE STUDIES AND STUDIES IN INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)

Second domestic language, 4 cr  
Foreign language, 3 cr  
ICT driving licence, 3 cr

### MINOR STUDIES, 25 CREDITS

### FREE-CHOICE STUDIES, 5-30 CREDITS

## REQUIREMENTS FOR THE MASTER'S DEGREE, 120 CREDITS

### MAJOR STUDIES

MIKRO501 Personal Study Planning for  
Achieving Master's Degree, 1 cr

#### Advanced studies

MIKRO500 Advanced Laboratory Courses,  
10 cr

MIKRO510 Comprehensive Laboratory Course,  
20 cr

MIKRO575 Food and Environmental Hygiene  
and Control, 5 cr

MIKRO600 Master's Thesis in Microbiology,  
40 cr

MIKRO610 Practical Training and Report, 3 cr

MIKRO630 Research Seminar in Microbiology,  
3 cr

MIKRO650 Master's Readings, 10 cr

### MINOR STUDIES 25 CREDITS

### FREE-CHOICE STUDIES, 3-28 CREDITS

## Courses in Finnish

### Basic Course in Microbiology (MIKRO200) 5 credits

86425

**Timing:** Spring term, period III

**Contents:** The biology of microorganisms, cell structure and function at the molecular and cellular levels, microbial ecology, microbial safety, interactions and taxonomy.

### Basic Seminar in Microbiology (MIKRO210) 5 credits

864064

**Timing:** period IV. It is recommended that this course is taken in the first study year. Students who take microbiology as their minor subject can substitute for this course by writing an essay (MIKRO290), in case it is evident that the skills achieved on this course have been acquired in the major.

**Contents:** Introduction to the creation and publication of microbiological knowledge. Current research at the division of microbiology; use of the internet and scientific library; source criticism; oral presentations and the use of Power Point.

### Basic Laboratory Course in Microbiology (MIKRO220) 5 credits

86463

**Timing:** Period I or II in the first or second study year. Several times and groups annually.

**Contents:** The methods of basic microbiology, including aseptic working conditions, safety in the laboratory, Gram staining, microscopy, inoculation, viable counting methods and identification of microbes.

### Food Microbiology (MIKRO231) 5 credits

864065

**Timing:** Period III

**Contents:** Water and food standard methods of analysis, food pathogens, microbiological spoilage of food, fermentation products. Microbiological safety in food production. Microbiological quality of drinking water.

### Food Microbiology, Laboratory practicals (MIKRO232) 5 credits

864067

**Timing:** Period IV

**Contents:** Standard methods used in food and water control, isolation and characterisation of food and water pathogens, anaerobic techniques, fermentation, hygiene, HACCP. Uncertainty of microbiological measurements.

### Environmental Microbiology (MIKRO241) 5 credits

864068

**Timing:** Period I

**Contents:** Knowledge of the most important microorganisms and microbiological processes in soil and water ecosystems.

### Environmental Microbiology, Laboratory Practicals (MIKRO242) 5 credits

864069

**Timing:** Period II

**Contents:** Knowledge of the most important research methods in microbial ecology with special emphasis on soils and waters.

### Writing an Essay in Microbiology (MIKRO290) 5 credits

864063

**Timing:** During basic studies.

**Contents:** See MIKRO210.

### Microbial Biotechnology (YBIOT315) 5 credits

86481

**Timing:** Recommended during the second or third study year, period II.

**Contents:** Production of proteins and enzymes,

bioactive metabolites and organic compounds by microbial cells; microbial diversity, environmental biotechnology, and bioremediation.

**Introduction to Employment for Microbiologists (MIKRO401) 1 credit**  
864081

**Timing:** Third study year, periods I and II.

**Contents:** Presentations given by microbiologists involved in different tasks, excursions to research institutes and factories, group work.

**Intermediate Level Examination (MIKRO450) 10 credits**  
86471

**Timing:** 3rd study year.

**Contents:** Microbial metabolic diversity, genetics, evolution, microbial diversity and ecology, immunology, microbial diseases and microbes in industry and research. Study material: Madigan & Martinko. 2006. Brock Biology of Microorganisms, 11th ed.

**Bachelor's Seminar (MIKRO480) 4 credits**  
864076

**Timing:** 3rd year

**Contents:** Use of the scientific library (1 credit); language studies (2 credits); oral presentation of a scientific topic (1 credit). Offered in collaboration with other divisions within our department.

**Bachelor's Thesis (MIKRO490) 6 credits**  
864021

**Timing:** 3rd year

**Contents:** Acquisition of a scientific style of writing and preparation of a written report of sufficient scientific depth.

**Personal study planning for achieving Master's degree (MIKRO501) 1 credit**  
864077

**Timing:** In the beginning of Master's studies.

**Comprehensive Laboratory Course (MIKRO510) 20 credits**  
86477

**Timing:** Periods III and IV

**Contents:** Isolation and characterisation of a bacterial culture by various methods (traditional, microscopy, API, Biolog, DNA fingerprinting, phylogeny, FAME, processing results). Good laboratory practice (GLP).

**Biotechnology of Fungi and Renewable Natural Materials (YBIOT525) 5 credits**  
864062

**Timing:** Recommended during the third study year, or in Master's degree. Period IV.

**Contents:** Fungi as living organisms; ecology and biotechnology of fungi; degradation of organic matter by fungi; details of fungal exoenzymes in wood decay; edible fungi; applications and use of fungi in pulp and paper industry.

**Research Methods for Fungal Biotechnology (YBIOT540) 5 credits**  
86485

**Timing:** Master's studies. Given every second year.

**Contents:** Isolation and cultivation of forest fungi as enzyme producers; protein purification, electrophoretic and kinetic characterisation of enzymes; enzymes as biocatalysts; RNA extraction, RT and quantitative PCR of fungal genes.

**Microbial Genetics, Laboratory Course (MIKRO560) 5 credits**  
864039

**Timing:** period IV.

**Contents:** Gene transformation, conjugation, cloning, and sequencing; marker and reporter genes.

**Forest Microbiology and Biotechnology (YBIOT570) 5 credits**  
864050

**Timing:** Period I, given every third year.

**Contents:** Excursions to Finnish forests, research institutes and factories, collection and isolation of microbes from forest and forest soil, laboratory work and demonstrations.

**Food and Environmental Hygiene and Control (MIKRO575) 5 credits**  
864073

**Timing:** Period III

**Contents:** Epidemiological studies; food control in Finland and elsewhere; hygiene, self-control, HACCP, certificate of hygiene skills; water, environmental and food standards; food, zoonotic and environmental pathogens; isolation and typing of pathogens.

**Research Methods for Cyanobacteria (MIKRO580) 5 credits**

864074

**Timing:** Periods I or II, usually every second year. Master's degree studies.

**Contents:** Cultivation and microscopy of cyanobacteria from water samples and toxin analyses (ELISA, PPIA, LC-MS). Molecular methods of cyanobacteria: DNA isolation, PCR, DGGE, sequencing and analysis of sequences

**Working in Research Group (MIKRO590) 5 credits**

86493

**Timing:** Recommended as a part of Master's studies.

**Contents:** Laboratory work for 4-6 weeks is primarily supervised and performed in one of the research groups at the Division of Microbiology.

**Master's Thesis (MIKRO600) 40credits**

86434

**Timing:** Master's degree

**Contents:** Completion of an individual laboratory project in microbiology of 3-6 months and preparation of a coherent, written thesis report book. The thesis book shall be divided into a review of relevant literature and a detailed report of the laboratory work and results.

**Practical Training and Report (MIKRO610) 3 credits**

86489

**Timing:** In Master's degree

**Contents:** Three months obligatory practical training in a microbiological laboratory. Training outside the Department of Microbiology is recommended.

**Teaching Practice (MIKRO620) 2-4 credits**

864027

**Timing:** Advanced studies

**Contents:** Working as a course assistant in MIKRO220 laboratory course.

**Microbiology, Research Seminar (MIKRO630) 3 credits**

864072

**Timing:** Free of choice. The students own presentation of the work performed for the Master's thesis.

**Contents:** Participation in 14 sessions, tutoring and presentation of one's own Master's work.

**Readings (MIKRO650) 10 credits**

86436

**Timing:** In Master's degree

**Contents:** Written and oral examinations based on suggested literature (books and/or review articles).

## Nutrition

The degree programme in nutrition deals with questions related to human nutrition. The main objective is to understand the significance of nutrition in promoting health and preventing diseases.

Studies of nutritional physiology provide the basis for an understanding, e.g. of the digestion and metabolism of nutrients in the human body. As social, economical, cultural and psychological factors influence individual and general food consumption, nutrition studies draw not only upon the biological sciences, but also upon the social and behavioural sciences. An understanding of food preparation and the physicochemical properties of foods is essential.

Nutrition majors graduate with the degree of Bachelor or Master of Science in Food Science. Studies abroad may also be included in the degree.

**Teaching staff**

Professor Marja Mutanen  
Professor Leena Räsänen  
University Lecturer Riitta Freese  
University Lecturer Christel Lamberg-Allardt  
Lecturer Endla Lipre

**Contact information**

Division of Nutrition  
P. O. Box 66 (Agnes Sjöbergin katu 2, Viikki, building EE)

Department of Applied Chemistry and Microbiology

FIN-00014 University of Helsinki  
tel. + 358 9 191 51  
fax + 358 9 191 58 269  
Internet: <http://www.mm.helsinki.fi/mmkem/rav>

## **REQUIREMENTS FOR THE BACHELOR'S DEGREE, 180 CREDITS**

### **GENERAL STUDIES**

- Y96 Demonstration of Proficiency in High School Mathematics, 0 cr  
Y120 Orientation to Studies, 0-1 cr  
Y130 Basics of Statistical Inference, 5 cr  
Y125 Basic Course in Research, 2 cr  
YKEM100 Chemistry, Lectures, 8 cr  
YKEM101 Chemistry, Laboratory Course, 5 cr  
BKEM100 Biochemistry I, 5 cr  
BKEM101 Biochemistry Basic Principles, Laboratory Course, 5 cr  
52081 Principles of Genetics, 3 cr

### **MAJOR STUDIES**

#### Basic studies

- RAV100 Basics of Human Anatomy and Cell Biology, 5 cr

Lectures and exercises in physiology, 15 cr

- BKEM200 Biochemistry II, 5 cr

#### Intermediate studies

- RAV101 Nutrition 1, 8 cr  
RAV102 Nutrition 2, 8 cr  
RAV103 Nutrition 3, 4 cr  
RAV120 The History and Meanings of Food Consumption, 2 cr  
RAV121 Basics of Nutritional Epidemiology and Food Consumption Studies, 3 cr  
RAV130 Basic Cooking, 5 cr  
RAV131 Foods as Dietary Components, 3 cr  
RAV132 Experimental Food Preparation, 5 cr  
RAV133 Foods in Diet Therapy, 4 cr  
RAV104 Academic Writing in Nutrition, 4 cr  
RAV105 The Nutrition Expert in Working Life, 2 cr  
RAV106 Bachelor's Thesis, 6 cr  
Maturity Essay

### **LANGUAGE STUDIES AND STUDIES IN INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)**

Second domestic language, 4 cr  
Foreign language, 3 cr  
ICT driving licence, 3 cr

### **MINOR STUDIES, 25 CREDITS**

Basic studies in Food Sciences, 25 credits

- MIKRO200 Basic Course in Microbiology, 5 cr  
EK110 Basics of Food Chemistry, 3 cr  
EK130 Food Safety and Control: Chemical Risk Factors, 5 cr  
EK225 Hypersensitivity Related to Food, 2 cr  
Elementary Courses in Food Technology, 5 cr  
Elective Courses in Nutrition, 5 cr

### **OTHER STUDIES, 25 CREDITS**

As agreed with the professor

### **FREE-CHOICE STUDIES, 7-8 CREDITS**

## **REQUIREMENTS FOR THE MASTER'S DEGREE, 120 CREDITS**

### **GENERAL STUDIES**

- Y126 Basic Course in Research 2, 2 cr  
Statistics, 5 cr

### **MAJOR STUDIES**

#### Advanced studies

- RAV200 Nutrition 4, 10 cr  
RAV201 Practical Training, 1 cr  
RAV202 Advanced Seminars in Nutrition, 4 cr  
RAV203 Master's Thesis, 40 cr  
Maturity Essay  
RAV204 Literature Examination, 4 cr  
RAV205 Personal Study Plan and Portfolio, 1-2 cr  
Elective studies in different fields of research and teaching, 23 credits

#### *A. Nutrition Physiology*

- RAV210 Advanced Nutritional Physiology, 10 cr  
RAV211 Methods in Experimental Nutrition, 10 cr  
Elective studies, 3 cr

#### *B. Nutrition of Populations*

- RAV220 Methodology for Studies on Food Consumption and Food Behaviour, 7 cr  
RAV221 Socio-cultural Food Research, 3 cr  
RAV222 Nutritional Epidemiology, 5 cr  
RAV223 Nutrition and Society, 4 cr  
Elective studies, 4 cr

*C. Nutrition and Food Service Management*  
 RAV220 Methodology for Studies on Food Consumption and Food Behaviour, 7 cr  
 RAV223 Nutrition and Society, 4 cr  
 RAV231 Food Service Planning, 8 cr  
 Elective studies, 4 cr

*D. General Nutrition*  
 Elective studies, 23 cr

**LANGUAGE STUDIES AND STUDIES IN INFORMATION AND COMMUNICATION TECHNOLOGY (ICT), 1 CREDIT**

**OTHER STUDIES, 25 CREDITS**

As agreed with the professor

**FREE-CHOICE STUDIES, 4-5 CREDITS**

**Courses in Finnish**

**Introduction to nutritional science (RAV090) 4-6 credits**

88235

**Timing:** First year in Bachelor's studies, periods III-IV

**Objective:** To know the basics of nutrients, public health nutrition and the association between nutrition and health

**Basics of human physiology (RAV091) 4 credits**

882016

**Timing:** Written exam at common department exam dates

**Objective:** Basic knowledge of human physiology

**Basics of human anatomy and cell biology (RAV100) 5 credits**

88294

**Objective:** Basics of human anatomy and histology

**Nutrition 1 (RAV101) 8 credits**

882004

**Objective:** To understand the basics of public health nutrition and physiology of food digestion and energy nutrients

**Nutrition 2 (RAV102) 8 credits**

882005

**Objective:** To understand energy metabolism, physiology of vitamins and minerals.

**Nutrition 3 (RAV103) 4 credits**

882006

**Objective:** To understand the relationship between diet and diseases. To know the basics of diet therapy.

**Academic writing in nutrition (RAV104) 4 credits**

88267

**Objective:** To practise professional and scientific writing skills, to get an insight into sources of scientific information.

**Nutrition expert in working life (RAV105) 2 credits**

88227

**Objective:** To make students familiar with employment available for nutrition professionals

**Bachelor's thesis in nutrition (RAV106) 6 credits**

88273

**Objective:** To learn how to acquire and use scientific information and to write a scientific report

**Tutoring of peer groups (RAV107) 3 credits**

882020

**Participation in a research project (RAV108) 1-5 credits**

88263

**The history and meanings of food consumption (RAV120) 2 credits**

88228

**Objective:** To know the history of food consumption and the cultural, social and emotional aspects of food behaviour

**Basics of nutritional epidemiology and food consumption studies (RAV121) 3 credits**

882007

**Contents:** Methods in nutritional epidemiology and food consumption studies

**Basic cooking (RAV130) 5 credits**

88250

**Objective:** To know the basics of practical cooking

**Foods as dietary components (RAV131)  
3 credits**

88217

**Objective:** To know the foods and foodstuffs and their nutrient content

**Experimental food preparation (RAV132)  
5 credits**

88257

**Contents:** Changes in foodstuffs during cooking (vegetables, grain products, milk and milk products, egg, meat, fish and fats)

**Foods in diet therapy (RAV133) 4 credits**

88240

**Objective:** To know the common needs for diet therapy

**Nutrition 4 (RAV200) 10 credits**

882008

**Objective:** To deepen the understanding of the association between nutrition and health.

**Practical training (RAV201) 1 credit**

88271

**Advanced seminars in nutrition (RAV202)  
4 credits**

88266

**Master's thesis in nutrition (RAV203)  
40 credits**

88272

**Literature examination (RAV204) 4 credits**

88274

**Personal study plan and portfolio (RAV205)  
1-2 credits**

882009

**Advanced nutritional physiology (RAV210)  
4-10 credits**

882010

**Methods in experimental nutrition (RAV211)  
3-10 credits**

882011

**Objective:** To learn the methods used in experimental nutrition

**Methodology for studies in food consumption and food behaviour (RAV220) 3-7 credits**

882012

**Objective:** To know the methodology used in studies on food consumption and food behaviour

**Socio-cultural food research (RAV221)  
3 credits**

882013

**Objective:** To know the theory and concepts of nutritional anthropology and sociology of food

**Nutritional Epidemiology (RAV222) 3 credits**

88222

**Nutrition and society (RAV223) 4 credits**

88218

**Timing:** Second year of Master's studies, period I.

**Objective:** To know the state of health in different populations and the means to interact

**Food service planning (RAV231) 3-8 credits**

882015

**Objective:** To know about food service planning.

**Postgraduate Studies in Nutrition (RAV300)  
1-10 credits**

882022



## General Chemistry

Courses in chemistry, biochemistry and biotechnology may be taken by students of the Faculty of Agriculture and Forestry; however, one cannot earn a degree in general chemistry in the Faculty of Agriculture and Forestry. Students majoring in agricultural sciences, forestry, food sciences, environmental sciences or biotechnology are required to take certain courses in chemistry, biochemistry and biotechnology listed in the study requirements of each major.

## CHEMISTRY

### Courses in Finnish

**Chemistry, Lectures (YKEM100) 8 credits**  
85011

**Timing:** Autumn term, period I/II

**Objective:** Basics of general, inorganic and organic chemistry

**Chemistry, Laboratory Course (YKEM101) 5 credits**  
85012

**Timing:** Autumn term, period I/II, spring term period III/IV

**Objective:** Basic working methods, with an emphasis on quantitative methods

**Physical Chemistry, Lectures (YKEM110) 6 credits**  
85043

**Timing:** Spring term, period III/IV

**Objective:** An introduction to the principles of kinetic theory of gases, thermodynamics, character of solutions, chemical equilibrium, chemical kinetics and electrochemistry

**Physical Chemistry, Laboratory Course (YKEM111) 3 credits**  
85044

**Timing:** Autumn term, period I

**Objective:** To make students familiar with scientific measuring, handling of results, estimation of errors and reporting results

**Applied organic chemistry (YKEM200) 6 credits**

850004

**Timing:** Autumn term, period I/II

**Objective:** Introduction to the reactions, reaction mechanisms and behaviour of organic molecules and functional groups. Transport effects and behaviour of organic matter in the environment are also covered

**Spectrometry, Lectures (YKEM210) 3 credits**  
85045

**Timing:** Spring term, period IV

**Objective:** The principles of spectroscopic methods (UV, IR, NMR, MS, ASS) and reading the spectra

**Organic Structural Analysis (YKEM211) 4 credits**

85035

**Timing:** Spring term, period III

**Objective:** An introduction to the instruments, equipment and reagents used in organic analytical work, and safety precautions. The isolation, purification and structural analysis of unknown organic compound

**Chromatography, Lectures (YKEM220) 3 credits**

85046

**Timing:** Spring term, period III

**Contents:** An introduction to the principles of chromatographic separations and chromatographic techniques and instruments

**Gas Chromatography (YKEM221) 2 credits**

85053

**Contents:** An introduction to practical capillary gas chromatographic work and optimisation of gas chromatographic separation

**Liquid Chromatography (YKEM222) 2 credits**

85054

**Objective:** An introduction to practical reverse and normal phase liquid chromatographic work and optimisation of separation

**Bioinorganic Chemistry (YKEM310) 3 credits**

850005

**Timing:** Autumn term, period II, every other year.

**Objective:** An introduction to the chemical

Department of Applied Chemistry and Microbiology

character of the elements, their biological function and analytical determination

**Project Work (YKEM400) 2-5 credits**  
85085

**Objective:** Participation in a research project or in teaching at the division. Amount of credits obtained depends on the nature of the participation

**Molecular Cell Biology (BKEM300) 5 credits**  
850008

**Timing:** Autumn term, period II

**Contents:** Introduction to the lifecycle of proteins starting from their synthesis and targeting until their degradation. The functions of the various cellular organelles and differences between animal and plant cells, as well as biosignaling and interactions between cells, are also covered.

## BIOCHEMISTRY

Information about the gene technology lecture BIOT200 and the laboratory courses BIOT200 can be found under the Biotechnology minor, p. 39.

### Courses in Finnish

**Biochemistry I (BKEM100) 5 credits**  
850006

**Timing:** Spring term, period IV

**Contents:** The general structure and main functions of proteins, enzymes, lipids and carbohydrates. Transport and basics of biosignaling in biological membranes. Includes an overview of energy metabolism in cells.

**Biochemistry I Laboratory Course (BKEM101)**  
**5 credits**  
85074

**Timing:** Autumn term, period I or II, Spring term, period III or IV

**Contents:** Isolation, purification and characterization of an enzyme; quantitative measurements of proteins and carbohydrates.

**Biochemistry II (BKEM200) 5 credits**  
850007

**Timing:** Autumn term, period I

**Contents:** Biochemical pathways of energy metabolism, biosynthesis of macromolecular precursors, and regulation of the cellular metabolism.

**Biochemistry II Laboratory Course (BKEM201) 5 credits**  
85069

**Timing:** Period II/III, every second year.

**Contents:** Functions and regulation of activities of tyrosinase and galactosyl transferase (in vitro) and malo-lactic enzyme (in vivo)

## BIOTECHNOLOGY

### Courses in English

**Basic Course in Gene Technology (BIOT200)**  
**2 credits**

**Laboratory Course In Gene Technology (BIOT201) 3 credits**

See course descriptions under the Biotechnology minor, p. 39.

## DEPARTMENT OF ECONOMICS AND MANAGEMENT

The Department of Economics and Management at the University of Helsinki is an education and research unit in agriculture economics, food economics, consumer economics and environmental economics. The countryside, nature, the environment and food are part of everyday life in Finland. At the Department of Economics and Management, these important topics are examined from the perspective of economics. Teaching and research in the division are based on the economic and social sciences, applied according to the special requirements of each subject.

### **Subjects taught at the Department of Economics and Management:**

Agricultural Economics  
Consumer Economics  
Environmental Economics  
Extension Education  
Food Economics  
Marketing  
Rural Entrepreneurship

### **Head of the department**

Professor Markku Koskela

### **Contact information**

Department of Economics and Management  
P.O. Box 27  
00014 University of Helsinki  
Finland  
tel. +358-9-191 58081  
fax +358-9-191 58 096  
Internet: <http://mm.helsinki.fi/mmtal/>

### **Courses in Finnish**

**Basic Course in the Social and Behavioral Sciences (MMTAL1) 5 credits**  
851032

**Introduction to Studies at the Department of Economics and Management (MMTAL2) 2 credits**  
80069

**Basic course in political science (MMTAL4) 5 credits**  
851034

**Introduction to Rural Policy (MMTAL12) 5 credits**  
80027

**Planning and decision-making systems in rural development (MMTAL13) 4 credits**  
80064

**Theoretical Approaches and Research Themes in Rural Policy (MMTAL14) 5 credits**  
80071

**Principles of social economy and co-operation (COOP1) 5 credits**  
899002

**Timing:** Autumn term, period I/II

**Objective:** In this study module students will become acquainted with different forms of entrepreneurship from the point of view of social economy and co-operation and the ideas and values behind economic thinking. The module will give students a good ground for understanding the special social-economical nature of co-operation in the context of social economy, the market and the public sector. During the course the history of co-operatives and other organisations of social economy, their judicial bases, values and economical and social meaning are introduced to the student, as well as the current situation with its definition of concepts in Finland and internationally.

**The Cooperative as a Solution to Socio-economic Problems and a Means of Development (COOP5) 5 credits**  
899018

**Timing:** Spring term, period III/IV

**Contents:** A synthesis of the block of studies will be made co-operatively in the study module. After the common introduction the students will choose the area which they will become familiar with in their individual work. As a theme for the work they can choose e.g.

Department of Economics and Management

traditional co-operation, wellbeing services, the new forms of employing and entrepreneurship, housing, ecology, the needs of civic society, the possibilities of consumer co-operation, social enterprises or the study of co-operation and social economy.

**Sustainable Development of Local Economies (COOP6) 5 credits**

899008

**Timing:** Autumn term, I/II period

**Contents:** This study module will look at the status of local institutions in the globalising economy and the meaning of the changes for the future of local institutions. The course will give students a good ground in the adoption and dissemination of innovations in institutions. The student will choose either a rural or a town context as his/her emphasis on the course.

**Co-operation in Finland: Memory, Past, Present and Future (COOP7) 5 credits**

899009

**Contents:** The study module will give students a good basic understanding of the birth, spread and growth of consumer and producer co-operation, and on its distribution and relevance for the Finnish societal development.

**The Cooperative as a Solution to Socio-economic Problems and a Means of Development (COOP5) 5 credits**

899018

**Timing:** Spring term, III/IV period

**Contents:** A synthesis of the block of studies will be made co-operatively in the study module. After the common introduction the students will choose the area which they will become familiar with in their individual work. As a theme for the work they can choose e.g. traditional co-operation, wellbeing services, the new forms of employing and entrepreneurship, housing, ecology, the needs of civic society, the possibilities of consumer co-operation, social enterprises or the study of co-operation and social economy.

## Agricultural Economics

Students majoring in Agricultural Economics complete a uniform programme of Bachelor's degree studies. Students studying for their Master's degree choose between two separate specialisation lines: 1) Production Economics and Farm Management or 2) Agricultural Policy. Students holding the Master's degree in Agricultural Economics will be able to analyze and deal successfully with economic issues facing individual farms and agricultural enterprises as well as with larger, sector-level domestic and international questions.

The central goal in Production Economics and Farm Management is to develop the ability to analyze the economic performance of farms and small-scale rural enterprises, and to identify factors contributing to it. Applied Business Management is based on theories of management and administration, theories of enterprise, theories of planning and accounting and evaluation. Empirical and problem-orientated efforts to find internal solution

models are typical for this study direction. Tools and techniques offered by other sciences are also used in Production Economics and Farm Management, whose scientific foundations are closely related to those of the study of rural enterprises, food economics and marketing. Microeconomic theory also provides linkages to agricultural policy.

Studies in Agricultural Policy focus on the effects of market forces and public policy on the welfare of society, rural development and the functioning of the entire food chain extending from producers to consumers. This field of science could be divided into two separate main areas. One examines agriculture as a part of the economy, while the other focuses on the practical effects of agricultural, rural and food policies in domestic and international contexts. Practical studies in Agricultural Policy are also engaged in finding and analyzing new policy measures in these areas. Studies in Agricultural Policy belong to discipline of Applied Economics. As

such, their main focus is on price theory, supply and demand theory, theory of international trade and welfare economics. It is also concerned with the approach of the so-called new political economics.

## Production Economics and Farm Management

### Contact information

Department of Economics and Management/  
Production Economics and Farm Management,  
PL 27 (Viikki, Building A, 6th floor),  
00014 University of Helsinki, telephone.  
1911(exchange), telefax 191 58096

Internet: <http://mm.helsinki.fi/mmtal/mae/index.htm>

### Office

Nina Niemeläinen, Office secretary

### Student Adviser

Heikki Mäkinen, M.Sc., Assistant

### Teaching staff

Professor Matti Ylätaalo  
Professor John Sumelius  
University Lecturer Matti Ryhänen  
Lecturer Aimo Turkki  
Researcher Stefan Bäckman  
Researcher Heikki Mäkinen  
Olli Rantala, M.Sc.  
Arto Latukka, Lis. Sc.  
Kyösti Pietola, Docent, Ph. D.

Department of Economics and Management

## Agricultural Policy

### Contact information

Department of Economics and Management/  
Agricultural Policy, PL 27 (Viikki, Building A, 6th  
floor), 00014 University of Helsinki, telephone.  
1911(exchange), telefax 191 58096

Internet: <http://mm.helsinki.fi/mmtal/mae/index.htm>

### Office

Outi Huuhka, office secretary

### Student Adviser

Assistant Antti Simola

### Teaching staff

Professor Jukka Kola  
Panu Kallio, Ph.D.  
Heikki Lehtonen, D.Sc. (Tech.)  
Jyrki Niemi, D.Sc. (Agr. & For.)

## REQUIREMENTS FOR THE BACHELOR'S DEGREE, 180 CREDITS

### GENERAL STUDIES

MMTAL2 Introductioin to Studies at the  
Department of Economics and  
Management, 2 cr  
Y150 Food Chain, 2 cr  
KTB111 The Basics of Crop Production, 5 cr  
KEL150 Introduction to Animal Production,  
5 cr  
Practical agricultural training, 3 cr  
Y96 Demonstration of Proficiency in High  
School Mathematics, 0 cr  
YE19 A+B Introduction to Mathematics I and II,  
6 cr  
Y55 Basic Course in Economics, 10 cr  
Y130 Basics of Statistical Inference, 5 cr  
Y131 Statistical Models 1, 5 cr  
Y145 Economics of Firm and Basics of  
Accounting, 4 cr  
Y85 Land and Water Law, 4 cr  
Y125 Basic Course in Research, 2 cr  
2-7 credits of the following courses are  
recommended:  
NEUVO1 Course in Communications  
Principles, 2 cr

Department of Economics and Management

MMTAL1 Basic Course in the Social and Behavioural Sciences, 5 cr  
MMTAL4 Basic Course in Political Sciences, 5 cr  
YE1 Basic Course in Environmental Economics, 5 cr

**MAJOR STUDIES**

Basic studies

MAE1 Basics of Agricultural Economics, 5 cr  
MPOL1 Agricultural and Rural Policy of the European Union, 5 cr  
MAL4 Basics of Farm Management, 10 cr  
MAL6 Productions Economics, 5 cr

Intermediate studies

MAE11 Bachelor's Seminar, 4 cr  
MAE12 Bachelor's Thesis, 6 cr  
Maturity essay

*Production Economics and Farm Management and Agricultural Policy:*

MPOL3 The Structural Development of Countryside, Agriculture and Food Economy, 6 cr  
MPOL4 Economics of Agriculture and Agricultural Policy, 7 cr  
MAL8 Farm Planning, 8 cr  
MAL10 Investment, Finance and Liquidity of Farm Business, 7 cr  
MAL5 Elementary Production Theory, 4 cr

At least two courses from the following:

MPOL5 Special Topics on EU and World Agriculture, 5 cr  
MAL9 Financial Accounting and Analysis of Farm Business, 5 cr  
MY1 Basics of Entrepreneurship, 5 cr  
YE1 Basic Course in Environmental Economics, 5 cr

*Rural Entrepreneurship*

MY2 Theories of Entrepreneurship, literature review, 5 cr  
MY3 Strategic Orientation of an Expanding Sme, 9 cr  
MY4 Theories of Entrepreneurship - literature review, 5 cr  
MY6 Service Industry in Forestry, 4 cr  
MARK6 Strategic Management, 5 cr  
EE061 Quality Management, 7 cr  
NEUVO8 Communication in Organizations, 6 cr

**LANGUAGE STUDIES AND STUDIES IN INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)**

Second domestic language, 4 cr

Foreign language, 3 cr  
ICT driving licence, 3 cr

**OTHER STUDIES**

Studies of agricultural economics according to Personal Study Plan, 5 cr

**MINOR STUDIES, 25 CREDITS**

Basic studies in one subject. Can be chosen freely

**FREE-CHOICE STUDIES, 8-10 CREDITS**

**REQUIREMENTS FOR THE MASTER'S DEGREE, 120 CREDITS**

**GENERAL STUDIES**

*A minimum of 4-28 credits from the following courses according to the field of research and teaching (Production Economics and Farm Management at least 21 cr; Agricultural Policy at least 28 cr; Rural Entrepreneurship at least 4 cr):*

Y56 Advanced Microeconomic Theory, 11 cr  
Y115 Operational Research, 4 cr  
Y126 Basic course in research 2, 2 cr  
Y132 Statistical Models 2, 8 cr  
Y136 Statistical Data Processing, 7 cr  
MAL15 Econometrics, 6 cr  
MAL16 Dynamic Optimization in Natural Resource Management and Agriculture, 5 cr  
MY3 Strategic Orientation of an Expanding Sme  
KE62 Qualitative Research Methods, 5 cr  
EE081 Survey Research Methods, 4 cr  
FECP210 Econometrics II, 6 cr  
FECM210 Quantitative Methods in Forest Resources Management, 5 cr

*In the field of research and teaching of Rural Entrepreneurship also the following courses are obligatory:*

EE037 Financial Planning and Management, 8 cr  
EE038 Management Accounting, 5 cr  
EE051 Product Pricing, 5 cr  
FECM230 Business Strategy and Management Simulations, 5 cr  
MARK14 Service Marketing, 5 cr

**MAJOR STUDIES**

Advanced studies

MAE31 Essays, 3 cr

MAE32	Readings, 5 cr
MAE33	Special Practical Training, 1 cr
MAE34	Seminar, 4 cr
MAE35	Master's Thesis, 40 cr
	Maturity Essay

*A minimum of 21-25 credits from the following courses according to the field of research and teaching (Production Economics and Farm Management at least 25 cr; Agricultural Policy at least 21 cr; Rural Entrepreneurship at least 21 cr):*

MPOL6	Research Methods and Models in Agricultural Policy, 7 cr
MPOL7	Political Economy of Decision Making, 7 cr
MPOL18	International Agricultural Trade and Trade Theory, 7 cr
MAL11	Valuation of Agricultural Resources, 5 cr
MAL12	Advanced Course in Farm Management, 6 cr
MAL14	Production and Cost Analysis, 6 cr
MAL17	Operational Research in Agriculture, 8 cr

#### FREE-CHOICE STUDIES, 14-21 CREDITS

#### Courses in Finnish or Swedish

**Basics of Agricultural Economics (MAE1)**  
5 credits  
82027

**Introduction to agricultural economics (MAE1a) 2 credits**  
81802

**Timing:** Autumn term, period II

**Contents:** The contents and tasks of agricultural policy as science, as well as the objectives and means of agricultural policy in practise. The course provides background and knowledge needed for more advanced courses in minor or major studies in agricultural economics and policy.

**Introduction to agricultural economics (MAE1b) 3 credits**  
81804

**Timing:** Autumn term, period II

**Contents:** An introduction to agricultural economics and farm management involving basic concepts, basic production theory, cost theory and calculation. Presentation of the

principles of production planning and of the general conditions for practicing agriculture.

**Introduction to agricultural economics (MAL1c) 3 credits**

81805

**Timing:** Autumn term, period II

**Contents:** An introduction to agricultural economics and farm management, involving basic concepts, basic production theory, cost theory and calculation. Presentation of production planning and of general conditions for practicing agriculture. This course is given in Swedish.

**Bachelor's seminar (MAE11) 4 credits**

81806

**Bachelor's thesis (MAE12) 6 credits**

81815

**Essays (MAE31) 3 credits**

81820

**Contents:** Essays on agreed topics.

**Readings (MAE32) 5 credits**

81821

**Contents:** A literature exam on major texts in agricultural economics and its research methodology.

**Special practical training (MAE33) 1 credit**

81822

**Timing:** During the summer of 3rd or 4th year

**Contents:** Introduction to selected relevant institutions in Agricultural Economics.

**Seminar (MAE34) 4 credits**

81823

**Contents:** Presentation and discussion of research plans and completed Master's thesis.

**Master's thesis (MAE35) 40 credits**

81824

**Timing:** During the 4th and 5th year

**Contents:** Students write a scientific thesis on a selected subject in their specialisation track. The Master's thesis is based on independent empirical research based on existing scientific literature and research results in the subject.

**Basics of Farm Management (MAL4)**  
**10 credits**

81817

**Timing:** Spring term, period I

**Contents:** The business concept of a firm; production planning, budgeting, accounting, investment analysis, production and cost theory, calculation of profitability and economic results, as well as the functions of management. Course also includes exercises in production planning. Basic tools and calculations of production planning are applied to a sample dairy farm. Exercises also include calculations for farm profitability, production costs and investment planning.

**Elementary Production Theory (MAL5)**  
**4 credits**

81819

**Timing:** Spring term, period IV

**Contents:** Basic production theory, input-output relationships, input-input relationships, product-product relationships, optimisations without constraints, graphic solutions with constraints, practical Excel examples. Economics of the scale, basic analysis of effectiveness and productivity.

**Productions Economics (MVTAL/MAL6)**  
**5 credits**

81841

**Timing:** Autumn term, period I

**Contents:** The factors affecting the profitability of crop and livestock enterprises.

**Farm Planning (MVTAL/MAL8) 8 credits**

81844

**Timing:** Autumn term, period I

**Contents:** Analysing and planning the farm business. Special emphasis will be on farm management in different production lines.

**Financial Accounting and Analysis of Farm Businesses (MAL9) 5 credits**

81846

**Timing:** Spring term, period I

**Contents:** The methods of financial accounting and financial statement analysis applied specifically to agricultural holdings. Presentation of the special characteristics of accounting practices of farming and related business activities.

**Investment, Finance and Liquidity of Farm Businesses (MAL10) 7 credits**

81814

**Timing:** Spring term, period III

**Contents:** The foundation of agricultural finance, financial management, investment theory and evaluation of capital investments. Presentation of various techniques of investment appraisal and of the relationship between repayment and cash flow. The course includes an exercise as a take-home assignment.

**Valuation of Agricultural Resources (MVTAL/MAL11) 5 credits**

81838

**Timing:** Autumn term, period I

**Contents:** Discussion of farm appraisal and valuation in terms of the value of the farms and their components. Includes discussion of the relationships between the profitability of agricultural and forest production and the values of the components. Completion of the course will involve the appraisal of a farm as a take-home assignment.

**Advanced Course in Farm Management (MVTAL/MAL12) 6 credits**

81842

**Timing:** Spring term, period IV

**Contents:** The operation of a farm as a management system. Special attention is directed to methods of planning, controlling, accountancy, and analysis.

**Production and Cost Analysis (MVTAL/MAL14) 6 credits**

81861

**Timing:** Autumn term, periods I and II

**Contents:** Basic tools for the analysis of decision-making from the perspective of dual production and cost theory.

**Econometrics I (MVTAL/MAL15) 6 credits**

81859

**Timing:** Spring term, period III

**Contents:** Introduction to econometric methods and their applications with particular reference to agriculture and agrobusiness: Ordinary Least Squares, Maximum Likelihood, Generalised Least Squares, and Weighted Least Squares, logit models. Special emphasis is on the interpretation of results. Diagnostic tests for multicollinearity, heteroscedasticity, autocorrelation. A selected number of scientific



articles are read and interpreted. Exercises in class with either Excel work sheets or the Eviews econometric package program.

**Dynamic Optimization in Natural Resource Management and Agriculture (MAL16) 5 credits**

81863

**Timing:** Spring term 2008, period III

**Contents:** The course will cover basics of dynamic optimization, dynamic programming and their applications to management of renewable natural resources and agriculture.

**Operational Research in Agriculture (MVTAL/MAL17) 8 credits**

81865

**Contents:** Special emphasis on analysing various financial calculations included in both the selection of a development plan and its implementation.

**Agricultural and rural policy of the European Union (MPOL1) 5 credits**

82001

**Timing:** Spring term, period III

**Contents:** Overview of the background and origins, development and future visions of the EU's Common Agricultural Policy and rural development programmes in the framework of economics and the new political economy.

**The Structural Development of Countryside, Agriculture and Food Economy (MPOL3) 6 credits**

82026

**Timing:** Autumn term, period I

**Contents:** Structural development in agriculture and in the food sector. Causes and consequences of structural development in agriculture, food industry and rural regions are evaluated through alternative models of structural change.

**Economics of Agriculture and Agricultural Policy (MPOL4) 7 credits**

82008

**Timing:** Spring term, period IV

**Contents:** Special characteristics of price formation and of supply and demand of agricultural and food products. Several different instruments and impacts as well as price systems are also examined. Demand and supply analyses, cost-benefit analysis and welfare

economics are employed as major theories and methods to assess the economic effects of the goals and means of agricultural policies.

**Special Topics in EU and World Agriculture (MPOL5) 5 credits**

82015

**Timing:** Autumn term, period II

**Contents:** An examination of international issues and problems relating to agriculture in the EU and the rest of the world. Lectures are augmented by seminar reports prepared by students on current topics linked to the theme of the course.

**Research Methods and Models in Agricultural Policy (MPOL6) 7 credits**

82010

**Timing:** Spring term, period III

**Contents:** We employ different methods, taught during the course, to analyse agricultural policy impacts. These methods include econometric estimation of demand and supply, comparative statics, mathematical programming, and sector models and partial equilibrium models.

**Political Economics of Decision Making (MPOL7) 7 credits**

82011

**Timing:** Autumn term, period II

**Objective:** We apply welfare economics, the theory of new political economy and game theory to examine and analyse impacts of agricultural, food and rural policies and political decision-making processes. We employ the income transfer efficiency analysis of policy to study interest groups and identify their goals and restrictions. We provide instruction in the comparison and evaluation of various different policy means in terms of national economic and budgetary implications and efficiency.

**International Agricultural Trade and Trade Theory (MPOL22/18) 7 credits**

82064

**Timing:** Spring term, period III

**Contents:** Examination of the nature of international trade of agricultural products, trade policies and practices, and trade negotiations in both an applied and a theoretical setting. Students will be introduced to the tools economists use to analyse international trade.

## Consumer Economics

Consumer economics is a multidisciplinary subject utilising approaches and methods from economic, social and behavioural sciences. Consumer economics studies current issues and provides a comprehensive understanding of consumer behaviour and of the welfare and environmental effects of consumption.

### Teaching staff

Professor Visa Heinonen

### Contact information

Department of Economics and Management  
P.O. Box 27 (Viikki A-building, 4th floor)  
FIN-00014 University of Helsinki  
Finland  
tel. +358 9 1911  
fax +358 9 191 58 096  
Internet: <http://mm.helsinki.fi/mmtal/ke>

### REQUIREMENTS FOR THE BACHELOR'S DEGREE, 180 CREDITS

#### GENERAL STUDIES

- Y55 Basic Course in Economics, 10 cr
- Y75 Managerial Accounting, 5 cr
- Y105 Basic Course in Marketing, 5 cr
- Y145 Economics of Form and Basics of Accounting, 5 cr
- Y150 Food Chain, 2 cr
- MMTAL1 Basic Course in the Social and Behavioural Sciences, 5 cr
- MMTAL2 Introduction to Studies at the Department of Economics and Management, 2 cr
- Basic studies in statistics, 5 cr
- MARK3 Marketing Research, 5 cr
- MY1 Basics of Entrepreneurship, 5 cr

#### MAJOR STUDIES

##### Basic studies

- KE1 Principles of Consumer Economics, 5 cr
- KE2 Introduction to Consumer Behaviour, 5 cr
- KE44 Consumer, Family and Society, 5 cr
- KE51 Ethics of Consumption and Consumer Policy, 5 cr

- KE31 Family and Property Legislation, 5 cr  
or KE32 Consumer Protection Legislation, 5 cr

##### Intermediate studies

- KE41 Resources in Household, 5 cr
- KE42 Practicum, 5 cr
- KE50 Advertising as a Medium in a Consumer Society, 5 cr
- KE52 Consumption and Society, 5 cr
- KE53 Consumer Sociology, 5 cr
- KE54 Economic Approaches to Consumer Behaviour, 5 cr
- KE71 Vocational Training, 3 cr
- KE64.1 Proseminar, 4 cr
- KE64.2 Bachelor's Thesis, 6 cr  
Maturity Essay

#### LANGUAGE STUDIES AND STUDIES IN INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)

- Second domestic language, 4 cr
- Foreign language, 3 cr
- ICT driving licence, 3 cr
- NEUVO1 Course in Communications Principles, 2 cr
- KE64.4 Scientific Writing, 3 cr

#### MINOR STUDIES, 25 CREDITS

#### FREE-CHOICE STUDIES, 23 CREDITS

### REQUIREMENTS FOR THE MASTER'S DEGREE, 120 CREDITS

#### GENERAL STUDIES

- Studies in statistics, 5 cr
- Y136 Statistical Data Processing, 7 cr

#### MAJOR STUDIES

##### Advanced studies

- KE56 The Study of Household Resources, 5 cr
- KE55 Consumer Economics and Alternative Economic and Social Science Approaches, Readings 3, 5 cr
- KE55.1 Consumer Economics and Alternative Economic and Social Science Approaches, 5 cr

KE61	Research Approaches in Consumer Economics, 5 cr
KE62	Qualitative Research Methods, 5 cr
KE63	Current issues in consumer economics, 5 cr
KE72	Advanced Level Practical Training, 3 cr
KE66	Seminar on Research Design and Planning, 5 cr
KE67	Thesis Seminar, 5 cr
KE68	Master's Thesis, 40 cr
	Maturity essay

#### **FREE-CHOICE STUDIES, 25 CREDITS**

#### **Course in English**

Teaching events in WebOodi

**Current issues in consumer economics (KE63) 5 credits**  
851019

#### **Courses in Finnish**

**Principles of Consumer Economics (KE1) 5 credits**  
851000  
**Objective:** The course presents the concept system in consumer economics, theoretical and methodical approaches and position in the field of economics. The roles of consumers and households in society are also treated.

**Introduction to Consumer Behavior (KE2) 5 credits**  
851044  
**Objective:** An introduction to the theories of consumer behaviour.

**Family and property legislation (KE31) 5 credits**  
850000  
**Objective:** An introduction to the Finnish legal system with special emphasis on legislation concerning households and families

**Consumer Protection Legislation (KE32) 5 credits**  
851003  
**Objective:** An introduction to legislation that protects and obligates consumers.

**Resources in household (KE41) 5 credits**  
850001

**Objective:** Theories and research in household resource and time management. A household as an acting unit.

**Practicum (KE42) 5 credits**  
850002

**Consumer, Family and Society (KE44) 5 credits**  
851008

**Objective:** The interaction between consumer and society. An essay is required.

**Advertising as a Medium in a Consumer Society (KE50) 5 credits**  
851050

**Ethics of Consumption and Consumer Policy (KE51) 5 credits**  
851012

**Objective:** An introduction to ethical issues, consumer policy and consumer policy in Finland and the EU.

**Consumption and Environment (KE52) 5 credits**  
851013

**Objective:** The interaction between consumption and the environment. The role of the environment in questions concerning consumption is taken into account

**Consumer Sociology (KE53) 5 credits**  
851014

**Objective:** A comprehensive study of consumption as a cultural, social and economical phenomenon.

**Economic Approaches to Consumer Behaviour (KE54) 5 credits**  
851015

**Objective:** An introduction to economic approaches to consumer and household behaviour.

**Consumer Economics and Alternative Economic and Social Science Approaches, Readings 3 (KE55) 5 credits**  
851016

**Objective:** An in-depth study of the theoretical approaches to consumer behaviour and the

Department of Economics and Management

theories based on economics and society used in consumer economics.

**Consumer economics and alternative economic and social science approaches (KE55.1) 5 credits**

851047

**Objective:** An in-depth study of the theoretical approaches to consumer behaviour and the theories based on economics and society used in consumer economics.

**The Study of Household Resources (KE56) 5 credits**

850003

**Research Approaches in Consumer Economics (KE61) 5 credits**

851017

**Objective:** An introduction to the theories of economics and social science that are used in the studies in consumer economics. The course also presents the basics of philosophy of science, as well as theoretical approaches and methodologies in economics and social science.

**Qualitative Research Methods (KE62) 5 credits**

851018

**Objective:** An introduction to qualitative research methods

**Proseminar (64.1) 4 credits 851020**

**Bachelor's Thesis (KE64.2) 6 credits**

851039

**Objective:** A written report on a certain phenomenon or current issue in consumer economics.

**Special Projects in Consumer Economics (KE64.3) 4 credits**

851041

**Scientific writing (KE 64.4) 3 credits**

851051

**Seminar on Research Design and Planning (KE66) 5 credits**

851022

**Thesis Seminar (KE67) 5 credits**

851023

**Objective:** Students engage in practical training for 12 weeks and make a report on their work (related to advanced studies).

**Master's Thesis (KE68) 40 credits**

851024

**Objective:** A written report on a certain phenomenon or current issue in consumer economics.

**Vocational Training (KE71) 3 credits**

851025

**Objective:** Students engage in practical training for 12 weeks and write a report on their work (related to intermediate studies).

**Advanced Level Practical Training (KE72) 3 credits**

851026

**Objective:** Students engage in practical training for 12 weeks and make a report on their work (related to advanced studies).

**Research Seminar (KE81) 5 credits**

851027

**Post-Graduate Literature Requirements (KE82) 10 credits**

851028

## Environmental Economics

Environmental economics examines how economic activities affect the interaction between society and environment, the use of natural resources and environmental protection. In environmental economics research two approaches are used: positive and normative analysis. Positive analysis studies how economic activities affect natural resources and environment. Normative analysis examines what goals in environmental protection and natural resource management are beneficial to society and how these goals could be reached by using economic incentives. Environmental economics also aims to find means to correct existing market distortions in order to promote sustainable use of natural resources and prevent the degradation of the environment.

### Teaching staff

Professor Markku Ollikainen  
University Lecturer Marko Lindroos  
University Lecturer Chiara Lombardini-Riipinen

### Contact information

Department of Economics and Management  
P.O. Box 27  
FIN-00014 University of Helsinki  
Finland  
tel. +358 9 1911  
fax +358 9 191 58 096  
Internet: <http://www.mm.helsinki.fi/mmtal/ye>

### REQUIREMENTS FOR THE BACHELOR'S DEGREE, 180 CREDITS

#### GENERAL STUDIES

MMTAL2 Introductioin to Studies at the Department of Economics and Management, 2 cr  
Y130 Basics of Statistical Inference, 5 cr  
MAL15 Econometrics, 6 cr  
Y85 Land and Water Law, 4 cr  
Y125 Basic Course in Research, 2 cr  
YMPS101 Basics of Environmental Protection (in Faculty of Biosciences), 5 cr  
Environmental studies according to Personal Study Plan, 6 cr

MAE1 Basics of Agricultural Economics, 5 cr  
FEC110 Introduction to Forest Economics, 8 cr

#### MAJOR STUDIES

##### Basic studies

Y55 Economics Principles, 10 cr  
or Y59 Economics, 10 cr  
YE19A Fundamental Methods of Mathematics for Economists I, 3 cr  
YE1 Introductory Course in Environmental Economics, 8 cr  
YE2 Environmental Policy in Finland and in the European Union, 4 cr

##### Intermediate studies

Y56 Microeconomics, 11 cr  
YE19B Fundamental Methods of Mathematics for Economists II, 3 cr  
YE3 Intermediate Environmental Economics, 8 cr  
YE4 Intermediate Natural Resource Economics, 8 cr  
YE7 Seminar on Environmental Economics, 4 cr  
YE8 Bachelor's Thesis, 6 cr  
Maturity Essay

One course from the following special courses:

YE5.1 Social Evaluation, 3 cr  
YE5.2 Agriculture and the Environment, 3 cr  
YE5.3 Forestry and the Environment, 3 cr  
YE5.4 Environmental Management, 3 cr

Two courses from the following special courses:

YE6.1 Energy Economics and the Environment, 3 cr  
YE6.2 Ecological Economics, 3 cr  
YE6.3 Material Efficiency and Life-Cycle Analysis, 3 cr  
YE6.4 Environmental Impact Assessment, 3 cr  
YE6.5 Economics of Waste, 3 cr  
YE6.6 Special Topics in Environmental Politics, 3 cr  
YE6.7 Others, 3 cr  
E6.E Current Issues in Environmental and Resource Economics

Department of Economics and Management

**LANGUAGE STUDIES AND STUDIES IN INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)**

Second domestic language, 4 cr  
Foreign language, 3 cr  
ICT driving licence, 3 cr  
Y10 Computer Science 2, 2 cr

**OTHER STUDIES**

Elective studies according to the Personal Study Plan, 20 cr

Recommended:

KA6.2 Public Economics (at the Faculty of Political Science), 5 cr  
KA8 Methods of Mathematical Economics (at the Faculty of Political Science), 9 cr

**MINOR STUDIES, 25 CREDITS**

**FREE-CHOICE STUDIES, 6 CREDITS**

**REQUIREMENTS FOR THE MASTER'S DEGREE, 120 CREDITS**

**MAJOR STUDIES**

Advanced studies

YE9 Advanced Environmental Economics, 10 cr  
YE10 Advanced Natural Resource Economics, 6 cr  
FEC210 Advanced Forest Economics, 4 cr  
YE11 Cost-Benefit Analysis, 4 cr  
YE12.1 Numerical Models in Environmental and Resource Economics, 6 cr  
Alternatively YE12.21 Dynamic Optimization, 6 cr  
YE14 Practical Training, 3 cr  
YE15 Advanced Seminar, 5 cr  
YE16 Oral Examination, 1 cr  
YE18 Master's Thesis, 40 cr

Maturity Essay

At least 16 credits from the following courses of different fields of research and teaching:

*A) Environment*

YE13.1 Environmental Regulation, 4 cr  
YE13.2 Agriculture and the Environment, 4 cr  
YE13.3 Forestry and the Environment, 4 cr  
YE13.4 Corporate Environmental Management, 4 cr  
YE13.5 Energy Economics and the Environment, 4 cr  
YE13.6 Ecological Economics, 4 cr

YE13.7 The Valuation of the Environment, 4 cr  
YE13.8 Free Trade and the Environment, 4 cr  
YE13.9 Environmental Politics and Climate Change, 4 cr

*B) Agriculture*

YE13.2 Agriculture and the Environment, 4 cr  
MAL4 Basics of Farm Management, 10 cr  
MAL6 Productions Economics, 5 cr  
MAL5 Elementary Production Theory, 4 cr  
MAL14 Production and Cost Analysis, 8 cr  
MPOL4 Economics of Agriculture and Agricultural Policy, 7 cr

*C) Forestry*

YE13.3 Forestry and the Environment, 4 cr  
YE13.7 The Valuation of Environmental Benefits, 4 cr  
FEC230 Forest Policy Analysis, 6 cr  
FECM220 Economics of the Timber Industry, 5 cr  
FECM210 Quantitative Methods in Forest Resource Management, 5 cr  
ME350 Agriculture and Forestry in Developing Countries, 3 cr

*D) Ecomanagement*

YE13.4 Corporate Environmental Management, 4 cr  
Y145 Economics of Farm and Basics of Accounting, 4 cr  
Y75 Managerial Accounting, 5 cr  
Y105 Principles of Marketing, 5 cr  
KE52 Consumption and Society, 5 cr  
YE6.3 Material Efficiency and Life-Cycle Analysis, 3 cr

**OTHER STUDIES**

KA6.2 Public Economics (at the Faculty of Political Science), 5 cr  
KA8 Methods of Mathematical Economics (at the Faculty of Political Science), 9 cr  
KA11/S2 Advanced Microeconomics, 15 cr

**FREE-CHOICE STUDIES, 6 CREDITS**

## Courses in English

### Teaching events in WebOodi

#### **Current Issues in Environmental and Resource Economics (YE6.E)** **3 credits**

863037

**Timing:** Spring term, period III

**Responsible person:** Chiara Lombardini-Riipinen

**Objective:** Students will

- become familiar with some of the current issues in environmental and resource economics.
- learn how to correctly acknowledge sources and to avoid plagiarism.
- learn how to search for articles using electronic databases and peer-reviewed e-journals
- improve their English writing and oral skills

**Realisation and working methods:** Oral and written presentations and discussions

**Evaluation:** The grades will be based upon:

1. Paper (content, organization and style), 50%
2. Oral presentation (organization, content and delivery), 30%
3. Class participation (quality and consistency of contributions), 20%

**Other information:** The language of instruction is English.

#### **Valuation of the Environment (YE13.7)** **4 credits**

863056

**Timing:** Autumn term, period I

**Responsible person:** Mika Rekola

**Relations to other study units:** YE3, YE4, YE9 required

**Objective:** An overview of environmental valuation methods.

**Contents:** Use of valuation methods in a policy context, history of non-market valuation methods, welfare change measures, survey techniques, contingent valuation, choice experiment, travel cost method, hedonic pricing. Assignments in processing valuation data.

**Realisation and working methods:** Lectures 16, practical work 10, group work 14, independent study 40 hours.

**Study materials and literature:** To be given during the course

**Evaluation:** Assignments 30%, essay 50%, group work 20%

**Other information:** The lectures are given in English

## Courses in Finnish

#### **Basic Course in Environmental Economics (YE1) 8-5 credits**

863000

**Timing:** Autumn term

**Contents:** Basic concepts and approaches in environmental economics and their relationship to other economic theories.

#### **Environmental policy in Finland and in the European Union (YE2) 4 credits**

863043

**Timing:** autumn term, period II

**Contents:** The course consists of lectures, reading exercises and case studies.

#### **Intermediate Environmental Economics (YE3) 8 credits**

863044

**Timing:** Spring term, period IV

**Contents:** Market failures, Coase theorem, Pigouvian tax, optimal abatement, cost effectiveness principle in local and global pollution, environmental policy instruments, environmental valuation techniques, non-point pollution, international trade and environment.

#### **Intermediate Natural Resource Economics (YE4) 8 credits**

863045

**Timing:** Autumn term, period I and II

**Contents:** Scarcity of resources, Hotelling rule, Faustmann model, Hartman model, Gordon-Schäfer model, fishery policy instruments, waste recycling models, biodiversity policies economics of biodiversity.

#### **Social Evaluation (YE5.1) 3 credits**

863004

**Contents:** Principles and basic methods of policy analysis, optimization and measuring and valuing environmental goods

#### **Agriculture and Environment (YE5.2) 3 credits**

863082

**Contents:** Nutrient leaching, biodiversity, pesticides, cultivation techniques, policy instruments, input intensity, land allocation

**Forestry and Environment (YE5.3) 3 credits**  
863083  
**Contents:** Nutrient leaching, biodiversity, recreation, silviculture, rotation models

**Environmental Management (YE5.4) 3 credits**  
863038  
**Timing:** Autumn term, period II  
**Contents:** Concepts of environmental management, environmental accounting, environmental management systems and their theoretical foundations.

**Energy Economics and the Environment (YE6.1) 3 credits**  
863070  
**Contents:** Foundations of energy economics, environmental impacts of energy production, nonrenewable energy sources and markets for fossil fuels, renewable energy sources, investments and choice of production technology, incentives to develop new production technologies, liberalization of electricity markets.

**Ecological Economics (YE6.2) 3 credits**  
863047  
**Timing:** Spring term  
**Contents:** Applications of ecological economics

**Material Efficiency and Life-Cycle Analysis (YE6.3) 3 credits**  
863049  
**Timing:** Spring term  
**Contents:** The concept of eco-efficiency and its applications in environmental politics.

**Practicals in Social Evaluation (YE6.4) 3 credits**  
863017  
**Timing:** Spring term  
**Contents:** Principles of environmental impact assessment, legislation, with special emphasis on the path from assessment to design and decision making.

**Economics of waste (YE6.5) 3 credits**  
863071  
**Objective:** To familiarize students with the management of waste from an environmental economic viewpoint.

**Special Topics in Environmental Politics (YE6.6) 3 credits**  
863050  
**Contents:** Exploration of such topics as fishery economics, transport economics, energy economics, etc.

**Fisheries Economics (YE6.K) 2-3 credits**  
863097  
**Timing:** Autumn term, period II  
**Contents:** Schäfer-Gordon model, fisheries management and international fisheries issues.

**Seminar on Environmental Economics (YE7) 4 credits**  
863007  
**Timing:** Autumn or spring term  
**Contents:** Preparation and presentation of a seminar paper. Students will serve as opponents and as chairpersons.

**Bachelor's Thesis (YE8) 6 credits**  
863026

**Advanced Environmental Economics (YE9) 10 credits**  
863052  
**Timing:** Spring term, period IV  
**Contents:** Theory of externalities, policy instruments of pollution control, public goods, valuation of the environment.

**Advanced Natural Resource Economics (YE10) 6 credits**  
863053  
**Timing:** Spring term  
**Contents:** Hotelling model, dynamic optimisation of renewable resources, international fisheries negotiations and game theory, multispecies bioeconomic models.

**Cost-Benefit Analysis (YE11) 4 credits**  
863054  
**Contents:** Main concepts and techniques for the choice of appropriate policies considering the efficient allocation of resources; review of the microeconomic foundations of cost-benefit analysis; valuation methods for assessing environmental services and natural resources; influence of the discount rate on the valuation of public projects, impact of risk and uncertainty on the outcome of an analysis; various case studies.



**Numerical models in Environmental and Resource Economics (YE12.1) 6 credits**

863068

**Timing:** Spring term, period IV

**Contents:** Class and individual assignments using Matlab.

**Dynamic Optimization (YE12.2) 6 credits**

863065

**Contents:** Examples from natural resource economics and optimal pollution control theory.

**Environmental Regulation (YE13.1) 4 credits**

863069

**Timing:** Spring term, period III

**Contents:** Problems in the permit market design, multiple pollutant market, mechanism design, static and dynamic price and quantity instruments, environmental regulation with asymmetric information

**Agriculture and the Environment (YE13.2) 4 credits**

863084

**Contents:** Nutrient leaching, biodiversity, pesticides, cultivation techniques, agricultural policy tools, land allocation, input intensity

**Forestry and the Environment (YE13.3) 4 credits**

863085

**Contents:** Biodiversity, nutrient leaching, recreation, silviculture, forest policy, rotation models

**Corporate Environmental Management (YE13.4) 4 credits**

863066

**Contents:** Strategic dimensions of environmental management

**Energy Economics and the Environment (YE13.5) 4 credits**

863072

**Contents:** Foundations of energy economics, environmental impacts of energy production, non-renewable energy sources and markets for fossil fuels, renewable energy sources, investments and choice of production technology, incentives to develop new production technologies, liberalization of electricity markets

**Ecological Economics (YE13.6) 4 credits**

863059

**Contents:** Applications of ecological economics

**Free Trade and the Environment (YE13.8) 4 credits**

863055

**Contents:** Effects of liberalization and integration of international trade on the environment, effects of environmental politics on international trade

**Environmental Politics and Climate Change (YE13.9) 4 credits**

863057

**Contents:** Theory of international agreements, optimal choice of instruments, assessment of the economic impacts of climate change and their mitigation.

**Sectors and the Environment (YE13.10) 4 credits**

863058

**Contents:** By agreement

**Practical Training (YE14) 3 credits**

863062

**Timing:** During 4th and 5th study year

**Contents:** Three-month training in environmental research institutes, in environmental administration or in firms

**Advanced Seminar (YE15) 5 credits**

863064

**Timing:** Autumn term and spring term

**Contents:** Preparation and presentation of the Master's thesis. Students will serve as opponents and as chairpersons.

**Oral Examination (YE16) 1 credit**

863061

**Timing:** Once a month

**Contents:** Discussions led by a teacher of central theories of environmental and resource economics and their applications.

**Master's Thesis (YE18) 40 credits**

863014

**Contents:** Writing the Master's thesis

Department of Economics and Management

**Fundamental Methods of Mathematics for Economists I (YE19a) 3 credits**

863063

**Timing:** Autumn term, period I

**Contents:** Function types, solution of equation system by elimination of variables, limit of function, continuity of function, slope and derivative of function, rules of differentiation, determination of extreme values of function, first and second derivative test, convexity, discounting, constrained optimization, matrix calculus, partial derivatives of functions with two or more variables

**Fundamental Methods of Mathematics for Economists II (YE19b) 3 credits**

863073

**Timing:** Autumn term, period II

**Contents:** Determination of extreme values of function with two or more variables; first- and second-order conditions; determinant of 3x3 matrix; Hessian matrix; differential, total differential and total derivative; implicit function rule; multiple constraint optimization; bordered Hessian matrix; inequality constraints and Kuhn-Tucker theorem; basics of integral calculus.

## Food Economics

Food economics is business economics and management applied to food industry, trade and services. The aim of this major is to educate experts for management and development functions who can respond to the challenges of the changing food sector. B.Sc. and M.Sc. degrees in Food Sciences are offered. The completion of the integrated M.Sc. programme takes 4 - 5 years.

**Fields of research and teaching in Food Economics**

In food economics it is possible to study general food economics or to specialise in (1) Hotel, restaurant and tourism management or (2) Entrepreneurship. Studies in accounting, quality management, logistics and marketing are included in this subject. There is also a minor in catering in food economics.

The aim of hotel, restaurant and tourism management studies is to educate experts for management and development functions in hotel, restaurant and tourism companies and organisations as well as for education and research. Instruction is arranged in co-operation with Haaga Polytechnic (Haaga Institute) and the Swedish School of Economics and Business Administration in Helsinki.

Almost all courses are lectured in Finnish. International students please contact the Student Advisor for more information.

**Teaching staff**

Professor Markku Koskela

University Lecturer Sirpa Tuomi-Nurmi

University Lecturer Pekka Lehtonen

Senior Assistant Helena Immonen (absent until 31.12.2006)

Acting Senior Assistant Eeva Lindroth (Student Advisor)

**Contact information**

Viikki Campus, A- building, 8th floor

P.O. Box 27

00014 University of Helsinki

Secretary Nina Niemeläinen

e-mail: [nina.niemelainen@helsinki.fi](mailto:nina.niemelainen@helsinki.fi)

tel. +358-9-191 58 516

fax +358-9-191 58 520

Internet: [www.mm.helsinki.fi/mmtal/ee](http://www.mm.helsinki.fi/mmtal/ee)

**Structure of the Studies**

The Bachelor's degree consists of basic studies, intermediate studies and studies in at least one minor. The scope of the advanced studies is limited. The Master's degree consists mainly of advanced and methodological studies. A practical training component lasting 12 weeks is included in the B.Sc. programme and an additional 12 weeks in the M.Sc. programme.

The extent of the study modules is given in credits. Lecture hours, exercises and other forms of instruction as well as independent studying are all regarded as work for which credits are granted.

## REQUIREMENTS FOR THE BACHELOR'S DEGREE, 180 CREDITS

### GENERAL STUDIES

- Basic studies in statistics, 5 cr  
 Y125 Basic Course in Research, 5 cr  
 Y145 Economics of Form and Basics of Accounting, 4 cr  
 Y75 Managerial Accounting, 5 cr  
 Y55 Basic Course in Economics, 10 cr  
 MMTAL2 Introductioin to Studies at the Department of Economics and Management, 2 cr  
 Y150 Food Chain, 2 cr  
 Y60 Commercial Law, 5 cr (only when specialising in Entrepreneurship)

### MAJOR STUDIES

#### Basic studies

- MY1 Basics of Entrepreneurship, 5 cr  
 EE047 Organizational Behaviour, 5 cr  
 EE038 Management Accounting, 5 cr  
 EE050 Demand and Consumption of Food Products, 5 cr  
 Y105 Basic Course in Marketing, 5 cr  
Intermediate studies  
 EE090 Practical Training 1, 3 cr  
 EE099 Readings, 5 cr  
 EE085 Research Methods, 5 cr  
 EE068 Bachelor Seminar, 4 cr  
 EE098 Bachelor's Thesis, 6 cr  
 Maturity Essay

Elective studies in different fields of research and teaching, 30 credits

### LANGUAGE STUDIES AND STUDIES IN INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)

- Second domestic language, 4 cr  
 Foreign language, 3 cr  
 ICT driving licence, 3 cr  
 NEUVO1 Course in Communications Principles, 3 cr  
 Elective language studies, 3 cr

### OTHER STUDIES, 15-25 CREDITS

### MINOR STUDIES, 25-50 CREDITS

Basic studies in one or two subjects depending on the interest in the fields of research and instruction in Food Economics

### FREE-CHOICE STUDIES, 6-11 CREDITS

## REQUIREMENTS FOR THE MASTER'S DEGREE, 120 CREDITS

### GENERAL STUDIES

- Y136 Statistical Data Processing, 7 cr

### MAJOR STUDIES

#### Advanced studies

- EE037 Financial Planning and Management, 8 cr  
 EE051 Product Pricing, 5 cr  
 EE081 Survey Research Methods, 5 cr  
 EE082 Exercises in Research Methods, 5 cr  
 KE62 Qualitative Research Methods, 5 cr  
 EE089 Literature 2, 8 cr  
 EE086 Research Seminar, 5 cr  
 EE088 Master's Thesis, 40 cr  
 Maturity Essay

One of the following courses:

- EE078 Individual exercise Master studies, 5 cr, or  
 MARK15 International Marketing, 5 cr

### LANGUAGE STUDIES AND STUDIES IN INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)

Language studies (4 cr) for those who want to specialise either in Hotel, restaurant and tourism management or Entrepreneurship

### OTHER STUDIES

- EE091 Practical Training 2, 3 cr  
 Elective studies, 8-10 cr

### FREE-CHOICE STUDIES, 10-16 CREDITS

### Courses in Finnish

#### Finacial Planning and Management (EE037) 8 credits

87037

**Timing:** period III

#### Management Accounting (EE038) 5 credits

87038

**Timing:** period I

#### Literature 1 (EE039) 5 credits

87039

**Timing:** On a general examination day.

**Contents:** The list of books is found on the www-pages of Food Economics.

**Knowledge-based entrepreneurship (EE043)  
5 credits**

87043

**Timing:** period II

**Objective:** The purpose of this course is to give students a holistic understanding of entrepreneurship, to consider it from individual and legal points of view

**Establishing One's Own Company (EE044)  
5 credits**

87044

**Timing:** period III

**Contents:** Documents needed in the beginning, marketing, financing and taxation of small enterprises. Comparison of legal forms of enterprises, among other things.

**Business plan development (EE045)  
7 credits**

87045

**Timing:** period III

**Objective:** The purpose of this course is to compile a business plan.

**Organizational Behavior (EE047) 5 credits**

87047

**Timing:** period I

**Demand and Consumption of Food Products (EE050) 5 credits**

87050

**Timing:** period III

**Objective:** The course will acquaint the students with demand and consumption of food products, changes in consumption behaviour and in markets. The point of view is that of the food sector primarily in Finland, but also internationally.

**Product pricing (EE051) 5 credits**

87051

**Timing:** Three different examination days in a year.

**From Idea to Product - Introduction to Product Development (EE054) 5 credits**

87054

**Timing:** period I

**Production Economics and Logistics (EE060) 5 credits**

87060

**Timing:** period IV

**Quality Management (EE061) 7-5 credits**

87061

**Timing:** period IV

**Bachelor seminar (EE068) 4 credits**

87068

**Timing:** Autumn or Spring

**Contents:** The course includes seminar working, mother tongue studies, information searching and communication studies

**Food Industry in Finland (EE072) 4 credits**

87072

**Timing:** Is not organised in 2006-2008.

**Contents:** A lecture series with several lecturers from within the Finnish food industry.

**Catering Industry, Special Features of Food Service (EE076) 5 credits**

87076

**Timing:** period IV

**Contents:** Actual issues to be examined are privatisation and organisational changes of operations

**Individual exercise in Food Economics (EE077) 5-7 credits**

87077

**Contents:** The student does an individual exercise, where he/she focuses on one chosen subject.

**Individual exercise Master studies (EE078) 5 credits**

87078

**Timing:** Master's degree studies

**Contents:** The contents are to be discussed with the responsible teacher. It can consist of an essay, an exam or different exercises. The subjects to be chosen from are the ones taught in food economics.

**Survey Research Methods (EE081) 4 credits**

87081

**Timing:** period I

**Objective:** The course initiates the student into empirical methods of business and managerial research concentrating especially on survey research.

**Exercises in Research Methods (EE082) 5 credits**

87082

**Timing:** Alternatively Autumn or Spring

**Objective:** The course prepares the student for thesis writing by means of analysis of research reports and scientific articles.

**Research Methods, Literature (EE083) 4 credits**

87083

**Timing:** Any time, on a general examination day.

**Contents:** Quantitative and qualitative research literature.

**Advanced seminar in food economics (EE084) 6 credits**

87084

**Timing:** II period

**Contents:** Seminar working, including serving as an opponent.

**Research Methods (EE085) 5 credits**

87085

**Timing:** 3. year, on a general examination day.

**Contents:** Quantitative and qualitative research literature.

**Research seminar (EE086) 5 credits**

87086

**Timing:** Autumn and Spring

**Contents:** Seminar working, presentation of the research plan, serving as an opponent, presentation of the research results and seminar essay.

**Technical Report Writing (EE087) 2 credits**

87087

**Master's Thesis (EE088) 40 credits**

87088

**Objective:** Master's thesis improves students ability to independently prepare and present scientific discourse and to critically evaluate new research.

**Literature 2 (EE089) 8 credits**

87089

**Timing:** Final year, on a general examination day

**Contents:** Accounting, management, food industry

**Practical Training 1 (EE090) 3 credits**

87090

**Timing:** Summer after first or second study year

**Practical Training 2 (EE091) 3 credits**

87091

**Timing:** Summer after third or fourth year of study.

**Objective:** Practical training included in advanced studies.

**Bachelor's Thesis (EE098) 6 credits**

87098

**Objective:** Bachelor's thesis improves students' ability to utilise previous research results and to critically evaluate them.

**Readings (EE099) 5 credits**

87099

**Contents:** Literature examination

## Marketing

As a discipline, marketing concentrates on issues applied particularly to organisations functioning in the field of agriculture and food economics. Accordingly, marketing offers a degree programme in both food science and agriculture that enables students to

- Understand the marketing problems of products and services
- Develop marketing strategies and procedures
- Understand consumer/user needs and respond to them

Marketing aims at giving its students an understanding of marketing in general. It also creates a framework for managing and planning marketing for a deeper understanding of corporate issues and corporate planning. Our marketing courses cover the following issues: marketing strategies, distribution management, how to create competitive advantage, marketing communications, industrial and service marketing, secondary livelihoods in agriculture and their marketing, and international marketing.

### Teaching staff

Professor Saara Hyvönen  
University Lecturer Petri Ollila  
University Lecturer Eiren Tuusjärvi

### Contact information

Department of Economics and Management  
Marketing  
P.O. Box 27  
FIN-00014 University of Helsinki  
Finland  
tel. +358 9 1911  
fax +358 9 191 58096  
www: <http://mm.helsinki.fi/mmtal/mark/>

### REQUIREMENTS FOR THE BACHELOR'S DEGREE, 180 CREDITS

#### GENERAL STUDIES

Basic studies in statistics, 5 cr  
MMTAL2 Introduction to Studies at the Department of Economics and Management, 2 cr

Y55 Basic Course in Economics, 10 cr  
Y60 Commercial Law, 4 cr  
Y75 Managerial Accounting, 5 cr  
Y145 Economics of Form and Basics of Accounting, 4 cr  
Y150 Food Chain, 2 cr (only Bachelor of Food Sciences)

#### MAJOR STUDIES

##### Basic studies

Y105 Basic Course in Marketing, 5 cr  
MARK1 Basics of Consumer Behaviour, 5 cr  
MARK3 Marketing Research, 6 cr  
MARK14 Service Marketing, 5 cr  
NEUVO6A Marketing Communication, Lectures, 4 cr

##### Intermediate studies

MARK2b Marketing Management and Planning (literature), 5 cr  
MARK6 Strategic management, 5 cr  
MARK20 Brand Management, 5 cr  
EE038 Management Accounting, 5 cr  
MARK22 Special Lecture Series, 4 cr  
MARK18 Bachelor's Thesis, 6 cr  
Maturity Essay

At least 15 credits from the following:

MARK4 Basics of Acquisition, 5 cr  
MARK5 Business-to-Business Marketing, 5 cr  
EE037 Financial Planning and Management, 8 cr  
EE047 Organizational Behaviour, 5 cr  
EE054 From Idea to Product - Introduction to Product Development, 5 cr  
MY1 Basics of Entrepreneurship, 5 cr

#### LANGUAGE STUDIES AND STUDIES IN INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)

Second domestic language, 4 cr  
Foreign language, 3 cr  
ICT driving licence, 3 cr  
Elective studies in languages and ICT, 4 cr

#### OTHER STUDIES

Agricultural training, 3 cr (only Bachelor of Agriculture and Forestry)  
EE090 Practical Training 1, 3 cr (only Bachelor of Food Science)

### MINOR STUDIES

Basic studies in Agricultural Science, 25 credits  
(only Bachelor of Agriculture and Forestry)  
Basic studies in Food Science, 25 credits (only  
Bachelor of Food Sciences)  
One elective minor subject, 25 credits

### FREE-CHOICE STUDIES, 11-13 CREDITS

### REQUIREMENTS FOR THE MASTER'S DEGREE, 120 CREDITS

#### GENERAL STUDIES

Studies in statistics, 5 cr (e.g. Y131 or an  
advanced course in statistics offered by the  
Faculty of Social Sciences)  
EE081 Survey Research Methods, 3 cr  
Y136 Statistical Data Processing, 7 cr  
KE62 Qualitative Research Methods, 5 cr

#### MAJOR STUDIES

##### Advanced studies

MARK2a Essential Theories in Marketing, 5 cr  
MARK7 Logistic Management, 5 cr  
MARK15 International Marketing, 5 cr  
MARK11a Special Theoretical Readings I, 5 cr  
MARK11b Special Theoretical Readings II, 10  
cr  
MARK9 Seminars, 5 cr  
MARK12 Master's Thesis, 40 cr  
Maturity Essay

#### LANGUAGE STUDIES AND STUDIES IN INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)

2. foreign language, 3 cr

#### OTHER STUDIES

MARK13 Special Training, 3 cr

### FREE-CHOICE STUDIES, 19 CREDITS

#### Course in English

Teaching events in WebOodi

**International Marketing (MARK15) 5 credits**  
81953

**Timing:** 4th year. Offered in the spring.

**Responsible person:** Ilkka Ronkainen

**Relations to other study units:** Y105

**Objective:** The aim of the course is to give a  
general overview of theoretical and practical

aspects of export marketing operations, and in  
international marketing.

**Realisation and working methods:** Lectures,  
cases, exercises

**Evaluation:** Exam, cases, exercise

**Other information:** Requires basic studies in  
marketing. Intensive course.

### Courses in Finnish

**Basics of Consumer Behavior (MARK1)  
5 credits**

81914

**Objective:** The aim of the course is to give a  
general overview of theories and practices in  
consumer behaviour.

**Essential theories in marketing (MARK2a)  
5 credits**

81919

**Timing:** Masters studies. Recommended to 4th  
year students

**Marketing management and planning  
(literature) (MARK2b) 5 credits**

81959

**Timing:** Recommend to 3rd year students

**Marketing Research (MARK3) 6 credits**

81904

**Timing:** Recommend to 2nd year students

**Objective:** The purpose of the course is  
to become familiar with different marketing  
research approaches and with planning and  
implementation.

**Basics of Acquisition (MARK4) 5 credits**

81918

**Timing:** Recommend to 2nd year students

**Business-to-Business Marketing (MARK5) 5  
credits**

81911

**Timing:** Recommend to 2nd year students

**Strategic management (MARK6) 5 credits**

81917

**Timing:** Recommend to 3rd year students

**Objective:** The aim of the course is make  
students familiar with strategic management  
and with different competition strategies.

**Logistic management (MARK7) 5 credits**

81941

**Timing:** Recommend to 3rd year students

Department of Economics and Management

**Seminars (MARK9) 5 credits**  
81966

**Special theoretical readings I (MARK11a) 5 credits**  
81920  
**Timing:** Recommended to 5th year students

**Special theoretical readings II (MARK11b) 10 credits**  
81921  
**Timing:** Recommended to 5th year students

**Master's Thesis (MARK12) 40 credits**  
81992

**Special Training (MARK13) 3 credits**  
81993  
**Timing:** This course should be taken in the summer after the 4th year.

**Service Marketing (MARK14) 5 credits**  
81952  
**Timing:** Recommended to 2nd year students

**Bachelor Thesis (MARK18) 6 credits**  
81956

**Brand Management (MARK20) 5 credits**  
81912  
**Timing:** Recommended to 4th year students

**Special lecture series (MARK22) 4 credits**  
81933

## Extension Education

The key issue for studies in extension education is how to manage change. In order to provide a better understanding of the processes of change we provide a theoretical background through interactive lectures and seminars, increase personal competence, and improve ability to communicate through practical exercises. As students are not trained for extension activities as such, they can seek challenges in any occupation that calls for the theoretical understanding and practical skills of communication and change agents.

The curriculum of extension education draws on concepts from sociology, adult education,

leadership theories and applied interpersonal and organisational communication.

Extension education is an optional subject that complements any major subject. We offer three courses (10 credits) in English. Although the division of Extension Education is situated at the Faculty of Agriculture and Forestry, it accepts students from any department within the University.

### Teaching staff

Professor Harri Westermarck  
Amanuensis Aune Kankkunen

### Contact information

Department of Economics and Management  
Extension Education  
PO Box 27  
00014 University of Helsinki  
Finland  
tel. +358 9 191 58 055  
fax +358 9 191 58 049

## Courses in English

### Teaching events in WebOodi

**Management and Leadership in Extension (NEUV05) 5 credits**  
82316

**Timing:** Spring term, period III/IV, intensive course.

**Responsible person:** Professor Harri Westermarck

**Objective:** After the course the student understands the concept of change agent systems (extension, research and education), knowledge management, communication and leadership.

**Contents:** Networking research, education and extension, corporate image, performance appraisals, leadership theories, extension systems in different countries. An optional study trip to Agricultural University Research Information Systems in Uppsala Sweden. Literature studies may be substituted for the trip.

**Realisation and working methods:** lectures 40, practical work 20, independent study 75 hours (trip to Uppsala).

**Evaluation:** Report on the study trip and optional literature.



**Other information:** Pre-registration by WebOodi.

**Special Topics in Extension and Marketing (NEUV010) 3 credits**

82321

**Timing:** Spring term, period IV, minimum 10 students.

**Responsible person:** Professor Harri Westermarck

**Objective:** Increased knowledge about marketing, communication theories, brand and image building, consumer education and selling techniques.

**Contents:** Lectures, visits and report writing on extension topics of interest to participants.

**Realisation and working methods:** Lectures 20, practical work 10, group work 10, independent study 40 hours.

**Evaluation:** Report writing.

**Other information:** Pre-registration by WebOodi.

**Special topics in extension (NEUV010a) 2 credits**

82328

**Timing:** Fall term, period I, minimum 10 students.

**Responsible person:** Professor Harri Westermarck

**Objective:** Increased knowledge about leadership and marketing theories, marketing studies and 1:1 approaches.

**Contents:** Lectures, visits.

**Realisation and working methods:** Lectures 15, group work 10, independent study 30 hours.

**Other information:** Pre-registration by WebOodi.

## Rural Entrepreneurship

Rural entrepreneurship is concerned with entrepreneurship and management of small and medium-sized start-up enterprises, especially in rural areas. Special attention is paid to recognising opportunities to start and manage a new and growing venture.

### Teaching staff

Professor Pekka Mäkinen

University Lecturer Pekka Lehtonen

### Contact information

Department of Economics and Management

Rural Entrepreneurship

P.O. Box 27

FIN-00014 University of Helsinki

Finland

Tel. +358 9 1911

Fax +358 9 191 58 096

## Courses in Finnish

### Basics of Entrepreneurship (MY1) 5 credits

899107

### Advanced course of Rural Entrepreneurship (MY2) 5 credits

899109

### Strategic Orientation of an Expanding Sme (MY3)

899108

### Theories of Entrepreneurship - literature review (MY4) 5 credits

899110

### Business Concepts in the Woodworking Industry (MY5) 5 credits

899111

### Rural Service Industry (MY6) 4 credits

899112

### Business analysis (MY7) 4 credits

899113

## DEPARTMENT OF FOOD TECHNOLOGY

The mission of the Department of Food Technology is to study and teach methods to make wholesome, safe and enjoyable foods available to the consumer.

The focus of research is on physical, chemical, biological and sensory properties of foods, as well as on specialized and commodity-based technologies.

Students major in Food Technology, both at the Bachelor's and Master's level. The Master's degree has four specialisation lines: General Food Technology, Cereal Technology, Dairy Technology and Meat Technology.

The permanent academic staff of the Department consists of five professors, five lecturers, and eight other staff members. About 15-20 post-graduate or post-doctoral students and researchers work in the Department on external funding. Students are encouraged to

take part in research projects throughout their studies, and they can earn credit by doing so.

As the language of instruction is Finnish, courses in Food Technology may not be taken by students who do not have a command of Finnish. However, visiting and exchange students can earn credit by participating in research projects.

### Head of the Department

Professor Hely Tuorila

### Contact information

Department of Food Technology  
P.O. Box 66

FI-00014 University of Helsinki  
Finland

tel. +358 9 1911

fax +358 9 191 58460

Internet: <http://mm.helsinki.fi/mmett/english/>

## Food Technology

### REQUIREMENTS FOR THE BACHELOR'S DEGREE, 180 CREDITS

Common to all four specialisation lines

#### GENERAL STUDIES

Y120	Orientation Course, 0 cr
Y96	Demonstration of Proficiency in High School Mathematics, 0 cr
Y100	Mathematics I, 5 cr
YFYS1	Physics I, 5 cr
YFYS2	Physics II, 3 cr
YKEM100	Chemistry, Lectures, 8 cr
YKEM101	Chemistry, Laboratory Course, 5 cr
YKEM110	Physical Chemistry, Lectures, 6 cr
BKEM100	Biochemistry I, 5 cr
Y130	Basics of Statistical Inference, 5 cr
Y131A	Statistical Models 1, 5 cr

#### MAJOR STUDIES

##### Basic studies

ETT110	Food Science and Technology at the University, 4 cr
ETT130	Principles of Food Technology, 10 cr

RAV090 Introduction to Nutritional Science, 4 cr

MIKRO200 Basic Course in Microbiology, 5 cr  
Elective studies in Food Sciences, 3 cr

##### Intermediate studies

ETT210	Packaging Technology 1, 5 cr
ETT215	Food Design and Processing, 10 cr
ETT220	Food Physics, 5 cr
ETT225	Physical Chemistry of Foods, 5 cr
MIKRO220	Basic Laboratory Course in Microbiology, 5 cr
MIKRO231	Food Microbiology, 5 cr
ETT230	Principles of Sensory Research, 10 cr
ETT235	Environmental Technology of the Food Industry, 2 cr
ETT240	Pathogens in Foods, 3 cr
ETT270	Practical Training 1, 1 cr
ETT280	Bachelor's Thesis, 6 cr
	Maturity Essay
ETT285	Seminars 1, 2 cr
ETT290	Literature Examination 1, 2 cr

**LANGUAGE STUDIES AND STUDIES IN INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)**

Second domestic language, 4 cr

Foreign language, 3 cr

ICT driving licence, 3 cr

Y10 Computer Science 2, 3 cr

ETT275 Introduction to Scientific Communication, 3 cr

**OTHER STUDIES**

ETT100 Planning and Follow-up of B.Sc. Studies, 1 cr

**MINOR STUDIES, 25 CREDITS**

Basic studies in Food Chemistry

**FREE-CHOICE STUDIES, 4 CREDITS**

**Courses in Finnish**

**Planning and Follow-up of B.Sc. Studies (ETT100) 1 credit**

8720001

**Timing:** 1st-3rd year

**Contents:** Preparation and follow-up of a personal study plan for Bachelor's degree. Group and personal meetings with teacher tutor.

**Food Science and Technology at the University (ETT110) 4 credits**

8720002

**Timing:** 1st year, autumn term, periods I and II

**Contents:** Introduction of the main subject, specialisation lines and courses available. Excursions to companies in the food field. Group work by inquiry learning. Library education. Initial planning of B.Sc. studies. Studies (1 credit) in mother tongue are included.

**Principles of Food Technology (ETT130) 10 credits**

8720003

**Timing:** 1st year

**Contents:** Includes courses ETT140, ETT150, ETT160 and ETT170

**Food Technology 1 (ETT140) 2.5 credits**

8720004

**Timing:** 1st year, autumn term, period I

**Contents:** Introduction to the properties of foods and risks of food handling. Focus on the

most important methods of ensuring the safety, wholesomeness and preservation of foods.

**Meat Technology 1 (ETT150) 2.5 credits**

8720005

**Timing:** 1st year, spring term, period III

**Contents:** Introduction to meat structure, chemistry, microbiology and technology. Basic meat biochemistry and foundations of the production of the most common types of meat foods and meat products.

**Dairy Technology 1 (ETT160) 2.5 credits**

8720006

**Timing:** 1st year, spring term, period IV

**Contents:** Introduction to milk chemistry, microbiology and technology. Basic operations of dairy processing and of the processes of manufacturing the most common dairy products.

**Cereal Technology 1 (ETT170) 2.5 credits**

8720007

**Timing:** 1st year, autumn term, period II

**Contents:** Introduction to cereal grain composition, structure and technologies. Basics of cereal processes and products, including factors affecting quality.

**Packaging Technology 1 (ETT210) 5 credits**

8720008

**Timing:** 2nd year, autumn term, periods I and II

**Contents:** Functions of a package; packaging materials; package design; marketing and environmental aspects of packaging; packaging regulations.

**Food Design and Processing (ETT215) 10 credits**

8720009

**Timing:** 2nd year

**Contents:** Basic knowledge and practical acquaintance of the most important unit operations used in food processing. Course includes lectures, outlines, discussions and 4 to 6 practical assignments.

**Food Physics (ETT220) 5 credits**

8720010

**Timing:** 2nd year, autumn term, period II

**Contents:** Thermal, mass transfer, mechanical, rheological and electrical properties of foods.

**Physical Chemistry of Foods (ETT225)  
5 credits**

8720011

**Timing:** 2nd year, spring term, period III

**Contents:** Water activity and water sorption of foods and their modelling. Phase and state transitions and their influence on processing, storage stability and kinetics of chemical reactions. Foods as dispersed systems. Emulsions and their stability. Gel formation and properties. Foams and their properties. Particle technology. Aroma-food matrix interactions.

**Principles of Sensory Research (ETT230)  
10 credits**

8720012

**Timing:** 3rd year

**Contents:** Sensory research methods. Application of statistical methods in data analysis.

**Environmental Technology of the Food Industry (ETT235) 2 credits**

8720013

**Timing:** 3rd year, spring term, period IV

**Pathogens in Foods (ETT240) 3 credits**

8720014

**Timing:** 3rd year, spring term, period IV (in May)

**Contents:** An introduction to food pathogens and their inhibition in food. A laboratory course.

**Practical Training 1 (ETT270) 1 credit**

8720015

**Timing:** Practical Training 1 should be taken during the summer after one or two years of study.

**Introduction to Scientific Communication (ETT275) 3 credits**

8720016

**Timing:** 3rd year, autumn term, period I

**Contents:** Procurement of information, planning and execution of a research project; oral and written reporting of research results.

**Bachelor's Thesis (ETT280) 6 credits**

8720017

**Timing:** 3rd year

**Seminars 1 (ETT285) 1 credit**

8720018

**Timing:** 3rd year

**Literature Examination 1 (ETT290) 3 credits**

8720019

**Timing:** 3rd year

**Contents:** Selected passages from Fellows, P.J. Food Processing Technology, 2nd ed.

## General Food Technology

The programme in General Food Technology covers the preparation, packaging, storage and distribution of food. The physicochemical and sensory changes that occur during these stages are studied, together with ways of controlling them. Instruction is provided in the use of food processing equipment and in the measurement of sensory quality and consumer reactions to foods and their components. After graduation, students will have career opportunities primarily in research, development and production in the food industry; however opportunities also exist in research institutes, regulatory authorities and in teaching positions in various educational institutes.

### Teaching staff

Professor Lea Hyvönen

Professor Hely Tuorila

University Lecturer Harry Helén

University Lecturer Kirsi Jouppila

## REQUIREMENTS FOR THE MASTER'S DEGREE, 120 CREDITS

### MAJOR STUDIES

#### Advanced studies

ETT410 Packaging Technology 2, 6 cr

ETT415 Separation Methods, 5 cr

ETT420 Extrusion, 5 cr

ETT425 Potential Novel Processing Technologies, 5 cr

ETT430 Literature Examination on Sensory Research, 4 cr

ETT470 Practical Training 2, 2 cr

ETT475 Exercise in Research, 5 cr

ETT480 Master's Thesis, 40 cr

Maturity Essay

ETT485 Seminars 2, 3 cr

ETT490 Literature Examination 2, 6 cr

**OTHER STUDIES**

ETT400 Planning and Follow-up of M.Sc. Studies, 1 cr

**MINOR STUDIES, 25 CREDITS**

**FREE-CHOICE STUDIES, 13 CREDITS**

**Courses in Finnish**

**Planning and Follow-up of M.Sc. Studies (ETT400) 1 credit**

8720020

**Timing:** 4th-5th year

**Contents:** Preparation and follow-up of a personal study plan for the Master's degree. Individual meetings with teacher tutor.

**Packaging Technology 2 (ETT410) 6 credits**

8720021

**Timing:** 4th year, spring term, periods III and IV

**Contents:** Barrier properties of packaging materials and their measurement, modified atmosphere packaging, aseptic packaging, biodegradable packages.

**Separation Methods (ETT415) 5 credits**

8720022

**Timing:** 4th year, spring term, period IV

**Contents:** Separation methods, including their principles, and equipment used in the food industry, especially in the manufacture of sugar products.

**Extrusion (ETT420) 5 credits**

8720023

**Timing:** 4th year, autumn term, period I

**Contents:** Construction, operation principles and applications of extruders; influence of process parameters on extrudate and its properties; use of response surface methodology and processing of data using Matlab software.

**Potential Novel Processing Technologies (ETT425) 5 credits**

8720024

**Timing:** 4th year, autumn term, period II

**Contents:** Working in small teams, students will study the literature related to a potential novel food processing method, write a report on the method and teach it to other students in the class.

**Literature Examination on Sensory Research (ETT430) 4 credits**

8720025

**Timing:** 4th year

**Contents:** Literature examination.

**Special Courses (ETT450) 0-10 credits**

8720026

**Timing:** 4th-5th year

**Contents:** Additional courses in food technology.

**Supervised Research (ETT460) 1.5-6 credits**

8720027

**Timing:** 1st-5th year

**Contents:** Active participation in the research projects of the department, including presentation of a short report. A maximum 1.5 credits can be earned by participating as a subject in the sensory evaluation studies.

**Practical Training 2 (ETT470) 2 credits**

8720028

**Timing:** Practical training 2 should be taken during the summer after four years of study.

**Exercise in Research (ETT475) 5 credits**

8720029

**Timing:** 5th year, autumn term, period I

**Contents:** To learn the different phases of research work.

**Master's Thesis (ETT480) 40 credits**

8720030

**Timing:** 5th year

**Seminars 2 (ETT485) 3 credits**

8720031

**Contents:** To learn how to follow and participate in the presentation of scientific research: Students will give two seminar presentations on their own thesis work, one at the planning stage and one during the final stages.

**Literature Examination 2 (ETT490) 6 credits**

8720032

**Timing:** 5th year

**Contents:** Literature examination. Profound knowledge of some area of food technology.

## Meat Technology

Meat Technology focuses on the chemical, physical and biological aspects of meat, meat microbiology, meat processing and the scientific methods of meat research. Graduates are familiar with meat as a raw material, as well as with meat processing methods, legislation and the economic aspects of the meat sector. Graduates will be able to use scientific methods to solve a wide range of problems in the meat sector.

Meat technology graduates are employed in production management, planning, quality control and marketing positions in the food industry and related areas, as well as in teaching and research.

### Teaching staff

Professor Eero Puolanne  
Senior Assistant Marita Ruusunen  
Pilot Plant Manager Olavi Törmä

## REQUIREMENTS FOR THE MASTER'S DEGREE, 120 CREDITS

### MAJOR STUDIES

#### Advanced studies

- ETT510 Lectures on Meat Science, 6 cr
- ETT515 Laboratory Exercises in Meat Science, 5 cr
- ETT520 Lectures on Meat Microbiology, 5 cr
- ETT525 Laboratory Exercises in Meat Microbiology, 6 cr
- ETT530 Lectures on Meat Technology, 6 cr
- ETT535 Practicum in Meat Technology, 12 cr
- ETT570 Practical Training 2, 2 cr
- ETT580 Master's Thesis, 40 cr
- Maturity Essay
- ETT585 Seminars 2, 3 cr
- ETT590 Literature Examination 2, 6 cr

### OTHER STUDIES

- KEL120 Anatomy of Farm Animals, 3 cr
- KEL130 Physiology of Farm Animals, 4 cr
- Elective studies according to Personal Study Plan, 15 cr
- ETT500 Planning and Follow-up of M.Sc. Studies, 1 cr

### FREE-CHOICE STUDIES, 6 CREDITS

## Courses in Finnish

### Planning and Follow-up of M.Sc. Studies (ETT500) 1 credit

8720033

**Timing:** 4th-5th year

**Contents:** Preparation and follow-up of a personal study plan for the Master's degree. Individual meetings with teacher tutor.

### Basic Processes of Meat Technology (ETT505) 3 credits

8720034

**Timing:** 1st year, spring term, period IV

**Contents:** An introduction on fresh meat and processed meats technologies. A pilot plant course.

### Lectures on Meat Science (ETT510) 6 credits

8720035

**Timing:** 4th year, autumn term, period I

**Contents:** Meat structure, biochemistry, water retention capacity and nutritional value of meat.

### Laboratory Exercises in Meat Science (ETT515) 5 credits

8720036

**Timing:** 4th year, autumn term, period I

**Contents:** To practise methods used in research on meat and meat products and the interpretation of these methods. A laboratory course.

### Lectures on Meat Microbiology (ETT520) 5 credits

8720037

**Timing:** 4th year, autumn term, period II

**Contents:** Spoilage and keepability of meat and meat products as well as meat fermentations.

### Laboratory Exercises in Meat Microbiology (ETT525) 6 credits

8720038

**Timing:** 4th year, autumn term, period II

**Contents:** The microbiological control of the quality of meat and meat products. A laboratory course.

### Lectures on Meat Technology (ETT530) 6 credits

8720039

**Timing:** 4th year, spring term, period III

**Contents:** An advanced course on fresh meat and processed meats technologies.

**Practicum in Meat Technology (ETT535) 12 credits**

8720040

**Timing:** 4th year, spring term, periods III and IV

**Contents:** The processing of meat and meat products as well as their chemical and microbiological analysis. A short independent project will also be completed. This course is held in the pilot plant and the laboratory.

**Special Courses (ETT550) 0-10 credits**

8720041

**Timing:** 4th-5th year

**Contents:** Additional courses in meat technology.

**Practical Training 2 (ETT570) 2 credits**

8720042

**Timing:** Practical Training 2 should be taken during the summer after four years of study.

**Contents:** Training at the Master's degree level in the field of meat technology. Students complete a written training report.

**Master's Thesis (ETT580) 40 credits**

8720043

**Timing:** 5th year

**Seminars 2 (ETT585) 3 credits**

8720044

**Literature Examination 2 (ETT590) 6 credits**

8720045

## Dairy Technology

Dairy technology is based on natural sciences, primarily applied chemistry, microbiology and technology. These sectors of research and education are connected to the practical functions of the dairy industry. The main objective of studies in dairy technology is to provide the necessary skills for employment in research, product and process development and management in dairy science and technology.

**Teaching staff**

Professor Tapani Alatossava  
Lecturer Asmo Kempainen  
Dairy Engineer Jyri Rekonen

## REQUIREMENTS FOR THE MASTER'S DEGREE, 120 CREDITS

### MAJOR STUDIES

#### Advanced studies

ETT610 Dairy Technology 2, 9 cr

ETT620 Dairy Technology 3, 9 cr

ETT630 Dairy Technology 4, 9 cr

ETT640 Dairy Technology 5, 9 cr

ETT650 Dairy Technology 6, 9 cr

ETT670 Practical Training 2, 2 cr

ETT675 Exercise in Research, 5 cr

ETT680 Master's Thesis, 40 cr

Maturity Essay

ETT685 Seminars 2, 3 cr

ETT690 Literature Examination 2, 6 cr

### OTHER STUDIES

Elective studies according to Personal Study Plan, 15-24 cr

ETT600 Planning and Follow-up of M.Sc. Studies, 1 cr

### FREE-CHOICE STUDIES, 3-12 CREDITS

## Courses in Finnish

### Planning and Follow-up of M.Sc. Studies (ETT600) 1 credit

8720046

**Timing:** 4th-5th year

**Contents:** Preparation and follow-up of a personal study plan for the Master's degree. Individual meetings with teacher tutor.

### Dairy Technology 2 (ETT610) 9 credits

8720047

**Timing:** 4th year, autumn term, period I

**Contents:** The fundamentals of dairy chemistry, microbiology and technology of milk and cream products. Practical training in the Viikki Research Dairy Plant is an essential part of the content of this course.

### Dairy Technology 3 (ETT620) 9 credits

8720048

**Timing:** 4th year, autumn term, period II

**Contents:** The fundamentals of dairy chemistry, microbiology and technology of fermented milk products and dairy spreads. Practical training in the Viikki Research Dairy Plant is an essential part of the content of this course.

**Dairy Technology 4 (ETT630) 9 credits**

8720049

**Timing:** 4th year, spring term, period III

**Contents:** The fundamentals of dairy chemistry, microbiology and technology of cheese. Practical training in the Viikki Research Dairy Plant is an essential part of the content of this course.

**Dairy Technology 5 (ETT640) 9 credits**

8720050

**Timing:** 4th year, spring term, period IV

**Contents:** The fundamentals of dairy chemistry, microbiology and technology of cheese ripening, dairy powders and ice cream. Practical training in the Viikki Research Dairy Plant is an essential part of the content of this course.

**Dairy Technology 6 (ETT650) 0-9 credits**

8720051

**Timing:** 4th-5th year

**Contents:** Additional courses in dairy technology.

**Practical Training 2 (ETT670) 2 credits**

8720052

**Timing:** 4th year (summer)

**Contents:** Training at the Master's degree level in the field of dairy technology. Students complete a written training report.

**Exercise in Research (ETT675) 5 credits**

8720053

**Timing:** 5th year

**Contents:** Students participate in the research projects of dairy technology, perform research under supervision and complete a written report.

**Master's Thesis (ETT680) 40 credits**

8720054

**Timing:** 5th year

**Seminars 2 (ETT685) 3 credits**

8720055

**Timing:** 4th-5th year

**Literature Examination 2 (ETT690) 6 credits**

8720056

**Timing:** 5th year

**Contents:** The exam consists of two parts. The first part covers three books common for every student, and the second part covers 1-2 books proposed by each student.

## Cereal Technology

Cereal technology is a product-oriented specialisation line within the M.Sc. programme in Food Technology. The cereal technology specialisation line is engaged in teaching research and development of the industrial uses of cereals on the basis of food science and technology. Cereal technologists may expect to find employment in research, development and production positions in companies that are involved in cereal processing.

### Teaching staff

Professor Hannu Salovaara

University Lecturer Tuula Sontag-Strohm

## REQUIREMENTS FOR THE MASTER'S DEGREE, 120 CREDITS

### MAJOR STUDIES

#### Advanced studies

ETT710 End-use Quality of Cereals 1, 3 cr

ETT715 End-use Quality of Cereals 2, 4 cr

ETT720 Cereal Chemistry and Biochemistry, 10 cr

ETT730 Cereal Processes and Technologies, 10 cr

ETT740 Biobusiness, 3 cr

ETT770 Practical Training 2, 2 cr

ETT775 Exercise in Research, 5 cr

ETT780 Master's Thesis, 40 cr  
Maturity essay

ETT785 Seminars 2, 3 cr

ETT790 Literature Examination 2, 6 cr

### OTHER STUDIES

ETT700 Planning and Follow-up of M.Sc. Studies, 1 cr

### MINOR STUDIES, 25 CREDITS

According to a Personal Study Plan

### FREE-CHOICE STUDIES, 8 CREDITS

## Courses in Finnish

### Planning and Follow-up of M.Sc. Studies (ETT700) 1 credit

8720057

**Timing:** 4th-5th year



**Contents:** Preparation and follow-up of a personal study plan for the Master's degree. Individual meetings with teacher tutor.

**End-use Quality of Cereals 1 (ETT710) 3 credits**

8720058

**Timing:** 4th year, autumn term, period I

**Contents:** The basic factors in the end-use value of cereals, quality classifications, methods of analysis, understanding and interpretation of quality parameters. Hygienic questions, storage conditions, mycotoxins. Quality of milling products. Malting barley and quality of malt.

**End-use Quality of Cereals 2 (ETT715) 4 credits**

8720059

**Timing:** 4th year, autumn term, period I

**Contents:** The methods used in the grain, flour and malt quality assessments/grading. Interpretations of the quality parameters.

**Cereal Chemistry and Biochemistry (ETT720) 10 credits**

8720060

**Timing:** 4th year, autumn term, period II

**Contents:** Chemical and biochemical properties and reactions in the grain material and in cereal products. Analytical methods used in cereal research.

**Cereal Processes and Technologies (ETT730) 10 credits**

8720061

**Timing:** 4th year, autumn term, periods I and II

**Contents:** Cereal processes; fractionation, milling, bread making, fermentation, malting. Practical work included.

**Biobusiness (ETT740) 3 credits**

8720062

**Timing:** 4th year, spring term, period III

**Contents:** Innovative food process development. Creation of new business on a virtual basis. Content modified for each course.

**Special Courses (ETT750) 0-10 credits**

8720063

**Timing:** 4th-5th year

**Contents:** Additional courses in cereal technology.

**Supervised Research (ETT760) 1.5-6 credits**

8720064

**Timing:** 1st-5th year

**Contents:** Students participate in the research projects of the cereal technology group, work as research assistants under supervision and complete a written report.

**Practical Training 2 (ETT770) 2 credits**

8720065

**Contents:** Training at the Master's degree level in the field of cereal technology. Students complete a written training report.

**Exercise in Research (ETT775) 5 credits**

8720066

**Timing:** 4th year, autumn and spring terms, periods II and III

**Contents:** To learn the different phases of research work.

**Master's Thesis (ETT780) 40 credits**

8720067

**Timing:** 5th year

**Seminars 2 (ETT785) 3 credits**

8720068

**Contents:** To learn how to follow and participate in the presentation of scientific research: Students will give two seminar presentations on their own thesis work, one at the planning stage and one during the final stages.

**Literature Examination 2 (ETT790) 6 credits**

8720069

**Timing:** 5th year

**Contents:** Literature examination. Profound knowledge of some area of cereal technology.

## DEPARTMENT OF FOREST ECOLOGY

The mission of the Department of Forest Ecology is to carry out scientific research and to provide teaching based on its disciplines. The Department has chairs in Silviculture, Tropical Silviculture, Forest Tree Ecology, Forest Soil Science and Peatland Ecology and Forestry.

Graduate studies in Forest Ecology relate to the functions of forest and peatland ecosystems during natural succession and how these systems can be changed by forest management and human impacts. The emphasis is on the boreal forest zone, including the northern timber line. Courses in tropical silviculture are also offered by the section of Tropical Forestry.

Students may complete a joint major subject in Forest Ecology, but they can specialise in any of the five fields of research and instruction represented by the above-mentioned chairs or in the four fields of Forest Pathology, Forest Tree Breeding, Forest Zoology or Wildlife Management represented by the Department of Applied Biology.

### Head of the Department

Professor Carl Johan Westman

### Contact information

P.O. Box 27  
FIN-00014 University of Helsinki  
tel. +358 9 191 58115 (office)  
fax +358 9 191 58100  
Internet: [www.helsinki.fi/mmtdk/mmeko](http://www.helsinki.fi/mmtdk/mmeko)

### Visiting address

Viikki campus  
Forest Sciences Building  
Latokartanonkaari 7

### REQUIREMENTS FOR THE BACHELOR'S DEGREE, 180 CREDITS

#### GENERAL STUDIES

ME100 Introduction to Studies in Forest Sciences, 3 cr  
KASV105 Basics Botany, 4 cr

52550 Plant Physiology (In the Faculty of Biosciences), 3 cr  
ME201 Dendrology of Forest Trees, 3 cr  
ME250 Forests of the World, 2 cr  
Y100 Mathematics I, 5 cr  
Y130 Basics of Statistical Inference, 5 cr  
Y131 A or B; Statistical Models 1, 5 cr  
Y125 Basic Course in Research, 2 cr  
MMEKN120 Ethics and Social Responsibility in the Forest Sector, 3 cr  
ME200 Personal Study Plan, 2 cr

#### MAJOR STUDIES

##### Basic studies

ME101 Basics of Forest Ecology and Silviculture, 3 cr  
ME102 Finnish Forest Soil Properties and Processes and the Forest Site Type Classification, 5 cr  
ME103 Forest Ecology, 6 cr  
ME104 Silviculture, 5 cr  
ME105 Field Course on Forest Ecology and Silviculture, 6 cr

##### Intermediate studies

ME106 The Metabolism, Growth and Structure of Trees, 5 cr  
ME107 Systems Analysis 1, 4 cr  
ME222 Structure, Dynamics and Biodiversity of Boreal Forests, 3 cr  
ME311 Forest Soil Sampling and Analysis of Soil Physical and Chemical Proper, 5 cr  
ME301 Practising for Working Life, 2 cr  
ME300 Seminar, 4 cr  
ME305 Bachelor's Thesis, 6 cr  
Maturity Essay

Elective studies in one or more fields of research and teaching, 23 cr

#### LANGUAGE STUDIES AND STUDIES IN INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)

Second national language, 4 cr  
Foreign language, 3 cr  
ICT driving licence, 3 cr  
MMVAR11 Excel Exercise in Forest Mensuration and Management, 2 cr

#### OTHER STUDIES

According to Personal Study Plan

### MINOR STUDIES, 25 CREDITS

Basic Studies in Forest Mensuration and Management, 25 credits

### REQUIREMENTS FOR THE MASTER'S DEGREE, 120 CREDITS

#### GENERAL STUDIES

- Y126 Basic Course in Research 2, 2 cr  
ME504 Field Course on Forestry in Northern Finland, 5 cr  
ME400 Personal Study Plan, 1 cr  
Elective Methodological Studies, 5 cr

#### MAJOR STUDIES

##### Advanced studies

- ME406 Systems Analysis 2, 3 cr  
ME407 Field Course at Forest Ecological Methods, 4 cr  
ME405 Sustainable Forestry, 3 cr, or  
ME457 Participatory Methods in Sustainable Management of Natural Resources, 5 cr  
ME408 Specific Topics on Forest Ecology, 4 cr  
ME402 Special Training, 3 cr  
ME403 Essays, 3 cr  
ME404 Thesis Seminar, 5 cr  
ME500 Master's Thesis, 40 cr  
Maturity Essay  
Elective studies in fields of research and teaching, 19-21 cr

### OTHER STUDIES, 23 CREDITS

#### Courses in English

##### Teaching events in WebOodi

#### Personal study plan (M.Sc.) (ME400) 1 credit

83675

**Timing:** M.Sc. studies (4th year). (Master's Degree Programme studies, 1st year).

**Responsible person:** Professor of chosen specialization line

**Objective:** To facilitate the smooth completion of degree studies by the student while supporting his/her career aims and interests.

**Contents:** The student will make a personal study plan for completing the Master's degree. The aim of the personal study plan is to set study targets and plan the timing of studies

while considering personal competencies, skills and goals in relation to career aims.

#### Special project (ME401) 3-8 credits

835011

**Timing:** M.Sc. studies (4th-5th year). (Master's Degree Programme studies, 1st-2nd year).

**Responsible person:** Professor of chosen specialization line

**Objective:** The student will become acquainted with a special question of forest ecology.

**Contents:** The special project can take the form of 1) a literature review, 2) planning a company project, 3) writing a research plan, 4) a development project to solve a practical problem, or 5) a video, an exhibition, etc.

**Evaluation:** Professor will evaluate the project.

#### Special training (ME402) 3 credits

835012

**Timing:** M.Sc. studies (4-5th year). (Master's Degree Programme studies, 1st-2nd year).

**Responsible person:** Professor of chosen specialization line

**Objective:** The student becomes familiar with his/her field and the demands of working life, and learns to apply theoretical knowledge to solve practical problems while learning on-the-job. The purpose of the training period is also to support career planning and promote future employment.

**Contents:** Training related to the department's teaching and/or field of research. Consists of practical or research-related tasks. Training may also take place abroad. The student must receive professor approval before the start of the training period.

**Realisation and working methods:** At least 4 weeks of training.

**Evaluation:** The student writes a report on the training period and presents a letter of reference.

#### Essays (ME403) 3 credits

835013

**Timing:** M.Sc. studies (5th year). (Master's Degree Programme studies, 2nd year).

**Responsible person:** Professor of chosen specialization line

**Objective:** To develop critical thinking capacities and learn to present facts and personal viewpoints clearly in written form. The student develops competencies necessary to produce fluent, grammatically correct factual text in the

field of forest ecology.

**Contents:** Practise in fluent writing in the field of forest ecology. Two to four reports are written on subjects agreed with the professor.

**Realisation and working methods:** Lectures 0, practical work 0, group work 0, independent study 80 hours.

**Evaluation:** Professor will evaluate the work on a pass/fail basis. The completion of this course is a prerequisite for participating in the maturity essay.

#### **Sustainable forestry (ME405) 3 credits**

83677

**Timing:** M.Sc. studies (4th year). (Master's Degree Programme studies, 1st year). The course is given in autumn term, II period.

**Responsible person:** University Lecturer

**Objective:** The student will acquire knowledge of the various elements and interactions related to the ecological, economical and socio-cultural sustainability of forest management. In addition, students will be acquainted with different strategic, tactical and operational solutions that have been used, and can be used, to achieve biodiversity in forest management.

**Contents:** : The course explores the concepts and theory of sustainable forestry and the definitions of ecological, economical and socio-cultural dimensions of sustainability. Special emphasis is placed on how sustainable forestry can be implemented in practice and on the relationships and trade-offs between different dimensions of sustainability.

**Realisation and working methods:** Lectures 28, practical work 0, group work 24, independent study 28 hours.

**Study materials and literature:** Literature handed out during the course.

**Evaluation:** Participation, presentation of written and oral report, and final exam.

#### **Field course on forest ecological methods (ME407) 4 credits**

83666

**Timing:** M.Sc. studies; course will be held for the first time in the summer of 2007.

**Responsible person:** Professor Hari

**Relations to other study units:** The following courses are recommended as prerequisites: ME331, ME332, ME432 and ME435.

**Objective:** The student will test and demonstrate principles and theories presented in the lectures. The student will also get acquainted with the

most recent measurement technology and the problems associated with field experiments.

**Contents:** By using instruments and data from SMEAR station, the students will get acquainted with forest material flows, especially the carbon cycle. In groups, the students will make a report on a topic to be agreed upon.

**Realisation and working methods:** Practical work 107 hours

**Evaluation:** Participation

**Other information:** Teaching in Finnish and in English.

#### **Master's degree thesis (ME500) 40 credits**

835015

**Timing:** M.Sc. studies (5th year). (Master's Degree Programme studies, 2nd year).

**Responsible person:** Professor of chosen specialization line

**Contents:** The student prepares a scientific thesis (on an agreed upon subject), which is primarily based on data collected by the student, but may also be based on existing data. The thesis should demonstrate readiness for scientific thought, command of necessary research methods, familiarity with the subject matter and readiness for scientific communication in one's field. The student must present an acceptable thesis plan prior to the start of thesis work.

**Evaluation:** Evaluation based on the opinion given by two examiners.

**It is possible to pass the following course also in English (see description under courses in Finnish):**

#### **Field course on forestry in Northern Finland (ME504) 3 credits**

### **Courses in Finnish**

#### **Introduction to studies in forest sciences (ME100) 3 credits**

83634

**Contents:** A general introductory course for all forestry students. The course gives a general overview of the forestry curricula and essential topics in forestry. The students are introduced to the forestry departments, teachers and staff, and study practise and options.

**Basics of forest ecology and silviculture (ME101) 3 credits**

83636

**Contents:** The structure and function of boreal forest ecosystems; boreal climate, soil, and vegetation types; tree growth and reproduction; the basics of silviculture; current forest legislation in Finland with particular reference to silviculture.

**Finnish forest soil properties and processes and the forest site type classification (ME102) 5 credits**

83637

**Forest ecology (ME103) 6 credits**

83640

**Timing:** B.Sc. studies

**Contents:** The course deals with the basics of ecology, ecological methods and theory, and specifically the structure, processes and scales of forest ecosystems. Themes in the course include: the history of ecology and its subdisciplines, the structure and development of forests at the stand and landscape levels, forest soils, material balances of forest ecosystems, and biodiversity.

**Silviculture (ME104) 5 credits**

835032

**Timing:** B.Sc. studies

**Contents:** Students learn how to grow and regenerate forests in different edaphic and climatic conditions taking into consideration economic, ecological and social sustainability of forests. Course topic includes: regeneration biology, production of tree seeds and seedlings, natural and artificial regeneration in mineral and peat soils, economy and environmental effects of forest regeneration, growth and yield of different kinds of tree stands growing on mineral and peat soils.

**Field course on forest ecology and silviculture (ME105) 6 credits**

83642

**Timing:** B.Sc. studies

**Contents:** The course covers site type classification of mineral soil sites and peatlands, stand growth and development in the framework of material flows and balances, as well as disturbance and succession dynamics and the main pathogens of boreal forests. On the basis of forest ecology, the students analyse

the effects of silvicultural measures on stand development. The course is carried out through a series of practical exercises that make use of forest ecological research and measurement methods.

**The metabolism, growth and structure of trees (ME106) 5 credits**

835029

**Timing:** B.Sc. studies

**Contents:** Basic mechanisms of whole tree ecophysiology. Main interest is on the hierarchy of the tree response to environment and the balanced functioning of tree. This course treats the ecophysiology of photosynthesis, respiration nutrient and water uptake and long distance transport in tree, impact of seasonality on tree functions and that of functional balance on tree growth and growth allocation, ecophysiology and whole tree strategies of reproduction.

**Systems analysis 1 (ME107) 4 credits**

83643

**Personal study plan (B.Sc.) (ME200) 2 credits**

830003

**Objective:** Students prepare their own personal study plan for completing the Bachelor's degree.

**Dendrology of forest trees (ME201) 3 credits**

830002

**Contents:** Identification and use of trees occurring in Finland.

**Field Course on Forest Ecology (ME205) 6 credits**

835033

**Seminar (ME300) 4-5 credits**

835009

**Timing:** B.Sc. studies

**Contents:** Written and oral scientific presentation skills, evaluation of both written and oral presentations. Planning of the student's compulsory B.Sc. thesis will be made during the course.

**Practising for working life (ME301) 2 credits**

83646

**Timing:** B.Sc. studies

**Contents:** Students update their personal study plans, engage in career planning, work with job

## Department of Forest Ecology

applications and their CV's, practice for job interviews, and become familiar with common rules of working life.

### **Bachelor's thesis (ME305) 6 credits**

83667

**Timing:** B.Sc. studies

**Contents:** A scientific thesis written on a specific subject agreed with the professor. The Bachelor's thesis is usually based on literature, but it may also be based on empirical material.

### **Thesis Seminar (ME304/404) 5 credits**

835014

**Timing:** M.Sc. studies

**Contents:** Prepares the student for the Master's thesis (ME405). The course consists of two parts: 1) Planning and organising the study: introductory lectures and preparation of individual research plans, 2) Preparing the report: oral presentations by students of the material, methods and results of the study. When the thesis is completed the results are presented in a seminar. The first part should be taken before, and the second part after the collection of the thesis material.

### **Systems analysis 2 (ME406) 3 credits**

83676

### **Specific topics on forest ecology (ME408) 4 credits**

830065

### **Current issues in forest ecology (ME501) 3 credits**

83644

**Timing:** M.Sc. studies

**Objective:** Study of a current topic in forest ecology.

### **Participation in courses and seminars (ME502) 2-10 credits**

83600

**Timing:** M.Sc. and Ph.D. studies

**Objective:** Study of a current topic in forest ecology.

### **Writing a scientific article (ME503) 3-20 credits**

835016

**Timing:** M.Sc. studies

**Contents:** Preparing a scientific paper from

his/her's Bachelor's or Master's thesis to be published in a scientific journal.

### **Field course on forestry in Northern Finland (ME504) 3 credits**

80043

**Timing:** M.Sc. studies (4th-5th year). (Master's Degree Programme studies, 2nd year). Field course in Northern Finland in September.

**Responsible person:** Docent Kubin

**Objective:** To provide the student with the most recent information on forestry and other relevant livelihoods practiced in Northern Finland via subjective experiences and local experts.

**Contents:** Along with silviculture in Northern Finland, the student will also become acquainted with reindeer farming, tourism, industry, the development of the area and the environmental risks in Lapland.

**Realisation and working methods:** lectures 0, practical work 0, group work 0, independent study 80 hours

**Evaluation:** Participation

**Other information:** Finnish is the primary language of instruction, but English can be used as necessary. Course registration in April.

### **Literature requirement for the Licentiate degree (Post-graduate literature) (ME601) 5 credits**

83558

**Timing:** Ph.D. studies

**Contents:** Advanced literature in forest ecology as agreed with the professor.

### **Forestry around the Baltic Sea (FOR310) 3 credits**

830091

### **Field trip (FOR511) 2-10 credits**

830087

## Forest Soil Science

Soil is one of the dominant environmental factors determining the structure and functioning of forest ecosystems. Studies in forest soil science will familiarize students with soil properties and processes and how they relate to forest growth, site productivity and ecosystem succession, as well as the impacts of forest management on soils and wider environmental issues, including

climate change. By its very nature, soil science is a cross-disciplinary science and draws on a basic knowledge of chemistry, physics, geology, physical geography, climatology, plant sciences, microbiology and statistics. Courses cover bedrock and quaternary geology and mineralogy, the effects of glaciation and deglaciation on the landscape and soil properties, site type classification, soil formation and classification, biogeochemistry (including carbon), ecohydrology, nutrient cycling and impacts of forest management, soil sampling and analysis (laboratory). Forest soil science studies are recommended for all students interested in the principles of forest ecosystem functioning and for those seeking employment in forest ecology research, sustainable forestry management and wood production, the multiple use of forests, and environmental planning and management.

#### Teaching staff

Professor Carl Johan Westman  
Docent, University Lecturer Michael Starr  
Laboratory Technician Marjut Wallner

### Courses in English

#### Teaching events in WebOodi

#### Soil formation and classification (ME310) 5 credits

83672

**Timing:** The course is given in autumn term every second year (even), period. I

**Responsible person:** University Lecturer Starr

**Objective:** The objective of the course is to provide the student with the necessary background in soil formation processes and properties to understand how soil horizons and profiles are formed and used to classify soils.

**Contents:** The course covers soil formation factors, processes and properties, diagnostic soil properties and horizons, and the principles of pedogenic soil classification. Main emphasis is on the FAO-Unesco world soil classification system, but the US Soil Taxonomy and World Reference Base for Soil Resources systems are also introduced.

**Realisation and working methods:** Lectures 28, practical work 28, group work 28, independent study 51 hours.

The course is based on a series of lectures, classroom-based practicals, preparation of a seminar on a relevant and agreed upon topic

by each student (or group) and presented to the course, and a 1-day field excursion .

#### Study materials and literature:

- FAO/Unesco. 1990. Soil map of the world. Revised Legend. World Soil Resources Report 60, FAO, Rome. 119 p.
- Bridges, E.M. 1978. World Soils. (2nd Edition). Cambridge University Press. 128 p.
- Birkeland, P.W. 1999. Soils and geomorphology. (3rd edition). Oxford University Press. 372 p.
- Keys to Soil Taxonomy. SMSS. latest edition.

**Evaluation:** Written examination, exercises and seminar.

#### Forest soil science literature review and evaluation (ME411) 6 credits

83683

**Timing:** M.Sc. studies (5th year). (Master's Degree Programme studies, 2nd year).

**Responsible person:** Professor Westman

**Contents:** A set of texts (books and scientific articles) selected by agreement with the professor will be read, reviewed and evaluated.

**Realisation and working methods:** Lectures 0, practical work 0, group work 0, independent study 62 hours.

**Evaluation:** Examination

#### Biogeochemistry of boreal forest ecosystems and soils (ME413) 5 credits

83628

**Timing:** M.Sc. studies. period III

**Responsible person:** University Lecturer Starr, Prof. Westman

**Objective:** The course objective is to provide the student with a systems analysis approach to the biogeochemistry (the transformation and flow of chemical materials) of boreal forest ecosystems, primarily on the stand scale.

**Contents:** The course covers: an introduction to systems analysis and modelling; derivation of nitrogen and mineral nutrient pools and flows in forest stands and catchments; processes (decomposition, weathering, litterfall, nutrient supply and uptake) affecting the flows; the central role played by the carbon and hydrological cycles; and the use of various empirical and simulation models to complement measurements.

**Realisation and working methods:** Lectures 54, group work 28, independent study 53 hours. Lectures and exercises using real-world data sets from boreal forests.

**Study materials and literature:** Literature list and exercises handed out during the course.

**Evaluation:** Exercises (50 %) and course report (50%)

**Other information:** Formerly: Water, nutrient element, and carbon flows in boreal forest ecosystems.

**Forest soil hydrology and water balance (ME414) 5 credits**

83678

**Timing:** M.Sc. studies, period IV

**Responsible person:** University Lecturer Starr, Prof. Westman

**Objective:** The objective of the course is to provide the student with an understanding of the eco-hydrology of forest ecosystems and soils, and the importance of the hydrological cycle in the flow of matter and many soil processes affecting forest ecosystem functioning.

**Contents:** The course will cover the soil hydraulic properties of both organic (peat) and upland soils, and the components of the water balance: precipitation (including snow pack formation and snowmelt), evapotranspiration, and soil water storage, water movement and flow on the stand- and small catchments scale. The implications for nutrient supply and leaching and the potential impacts of global warming on the water balance will also be covered.

**Realisation and working methods:** Lectures 58, practical work 28, independent study 49 hours. Lectures will systematically cover each component of the water balance, and a series of classroom practicals and home exercises using real-world data sets and various hydrological models will be allocated during the course. A seminar on a relevant and agreed upon topic is to be prepared and presented by each student (or group).

**Evaluation:** Written examination, exercises and seminar.

**It is possible to pass the following course also in English (see description under courses in Finnish):**

**Forest soil sampling and analysis of soil physical and chemical properties (ME311) 5 credits**

**Courses in Finnish**

**Forest soil sampling and analysis of soil physical and chemical properties (ME311) 5 credits**

83659

**Timing:** B.Sc. studies (2nd -3rd year). (Master's Degree Programme studies, 1st-2nd year). The course is given in autumn term, period I.

**Responsible person:** Professor Westman

**Objective:** The course objective is to provide the student with knowledge about soil sampling, laboratory analysis of soil physical and chemical properties, the calculation of laboratory results, and on how to present and evaluate the results.

**Contents:** The course will cover the theory of soil sampling, including spatial and temporal issues; the description of site and tree stand (biomass) and the soil profile. Laboratory practicals include sample pre-treatment and the determination of soil physical properties (particle size analysis, bulk density, water retention properties and the pF curve) and soil chemical properties (loss-on-ignition, carbon and nitrogen contents, cation exchange capacity, base saturation, total and exchangeable mineral nutrients, acidity, and pedogenic Fe and Al fractions), and the calculation of nutrient pools in the soil. The necessary chemistry for calculating and understanding concentrations in various units (mass, mole, and charge equivalent concentrations) will be taught. The importance of coarse fragment (stone) content in calculating soil elemental pools will also be covered.

**Realisation and working methods:** Lectures 14, practical work 95, group work 0, independent study 26 hours. A 1-day field excursion (sampling); introductory lectures; pre-treatment of the samples in the laboratory; laboratory analysis of soil properties, preparation of written report.

**Study materials and literature:** Literature and laboratory manuals given out during the course.



**Evaluation:** Report 50% and final examination 50%.

**Other information:** Finnish is the primary language of instruction, but English can be used as necessary.

**Forest soils and silvicultural practice (ME312) 3 credits**  
83681

## Forest Tree Ecology

Forest tree ecology examines the biological basis of forest management and use. The aim is to teach students to understand how the forest ecosystem functions and to train students in quantitative forest research. The importance of theory in understanding the functioning of forest ecosystems is emphasised. The studies require a basic knowledge of physics, statistics, computer science and modelling.

### Teaching staff

Professor Pertti Hari  
Docent Eero Nikinmaa  
Docent Pauline Stenberg

### Courses in English

#### Teaching events in WebOodi

**Methodology of Forest Tree Ecology (ME431) 8 credits**  
83654

**Timing:** M.Sc. studies (4th year). (Master's Degree Programme studies, 1st-2nd year). The course is given in the spring term, in even-numbered years, period IV.

**Responsible person:** Professor Hari

**Objective:** To learn how to produce informative forest tree ecological data.

**Contents:** Students become acquainted with the production of informative data. The course analyses sources of error caused by sample design and measurement and how to minimise them.

**Realisation and working methods:** Lectures 20, practical work 60, group work 40, independent study 56 hours.

**Study materials and literature:** To be decided

**Evaluation:** Group work.

**Other information:** Teaching in English or in Finnish. Field exercise will be offered in August or September at Värriö Research Station.

**Advanced literature (ME433) 6 credits**  
83609

**Timing:** M.Sc. studies (5th year). (Master's Degree Programme studies, 2nd year).

**Responsible person:** Professor Hari

**Contents:** Readings in the theoretical background and applications of forest tree ecology.

**Realisation and working methods:** Lectures 0, practical work 0, group work 0, independent study 160 hours

**Study materials and literature:** A set of texts (books and scientific articles) selected by agreement with the professor.

**Evaluation:** Examination

**Other information:** In Finnish or in English.

### Courses in Finnish

**Micrometeorology (ME331) 6 credits**  
83648

**Timing:** B.Sc. studies

**Contents:** The course presents the basic knowledge the factors controlling radiation, temperature and humidity conditions in forest stands. Mathematical models are used to estimate how stand structure affects radiation uptake and thermal balance. The student will also learn how micrometeorology can be utilised in forest management.

**Physics, chemistry and influences of air pollutants; field course (ME430) 5 credits**  
83625

**Timing:** M.Sc. studies

**Contents:** Basic knowledge about the interaction between forest and atmosphere with an emphasis on measuring techniques. The treated phenomena deal with boundary layer, tree functions and soil.

**Changing environmental factors and forests (ME434) 3 credits**  
83617

**Timing:** M.Sc. studies. Odd-numbered years, period IV.

**Contents:** The effects of the most important environmental changes (increasing CO<sub>2</sub>, temperature and nitrogen deposition) on basic

Department of Forest Ecology

metabolic processes and on stand development over the past 50 - 100 years.

**Research Seminar on Forest Tree Ecology (ME631) 5 credits**

83660

**Timing:** Ph.D. studies

## Peatland Ecology and Forestry

Peatland Ecology and Forestry concentrates on the ecology and utilisation of peatlands, especially for forestry purposes. The major has close connections to plant ecology, geology, microbiology and hydrology, as well as to silviculture and forest management. In addition, technical subjects are studied in connection with tree harvesting and the planning of additional drainage/ditch cleaning and/or restoration. The special features of peatlands have to be taken into consideration in planning and conducting any operations on them. Advanced studies in peatland ecology and forestry are recommended for those who are interested in the ecology of peatlands, silviculture or forest amelioration and who need this information in research, teaching and practical forestry.

**Teaching staff**

Professor Harri Vasander

Docent Jukka Laine

Docent Juhani Päivänen

University Lecturer Kari Minkkinen

Docent, Researcher Raija Laiho

Erkki Raikamo, M.Sc.

Researcher Sakari Sarkkola

Researcher Eeva-Stiina Tuittila

## Courses in English

**Teaching events in WebOodi**

**Ecology of peatlands (ME341) 3 credits**

84118

**Timing:** B.Sc. studies (2nd -3rd year). (Master's Degree Programme studies, 1st-2nd year). The course is given in autumn term in even-numbered years, I period.

**Responsible person:** Professor Vasander

**Objective:** The student will acquire in-depth knowledge of peatland ecosystem processes and the biotic and abiotic factors impacting them.

**Contents:** This course gives a thorough understanding of the ecology of natural and drained peatland ecosystems.

**Realisation and working methods:** Lectures 28, practical work 0, group work 28, independent study 53 hours.

**Study materials and literature:** Literature list handed out during the course.

**Evaluation:** Final examination.

**Other information:** The course includes field excursions.

**Mires of the world (ME343) 2 credits**

84120

**Timing:** B.Sc. studies. (Master's Degree Programme 1st-2nd year).

**Responsible person:** Prof. Vasander

**Contents:** Special literature on the subject.

**Realisation and working methods:** Lectures 0, Practical work 0, Group work 0, Independent study 53 hours.

**Evaluation:** Examination.

**Forest management on peatlands (ME345) 3 credits**

84105

**Timing:** M.Sc. studies

**Responsible person:** Docent Päivänen

**Contents:** Information on the amelioration of peatlands: theory, technique and legislation.

**Other information:** Lectures in Finnish, but it is possible to complete the course as a literature exam.

**Special literature 1 (ME441) 5 credits**

84113

**Timing:** M.Sc. studies (5th year). (Master's Degree Programme studies, 2nd year).

**Responsible person:** Professor Vasander

**Objective:** To deepen one's knowledge of peatland ecosystems.

**Contents:** Advanced information on mire ecosystems.

**Realisation and working methods:** Lectures 0, practical work 0, group work 0, independent study 133 hours.

**Study materials and literature:** Material will be selected from the following: Charman, Dan 2002. Peatlands and Environmental Change. John Wiley & Sons Ltd, Chichester. 312 pp. ISBN 0-470-

84410-8. Gore, A.J.P. (ed.) 1983. Ecosystems of the world. 4A. Mires: Swamp, bog, fen and moor. General studies. Elsevier Scientific Publishing Company, Amsterdam-Oxford-New York. Gore, A.J.P. (ed.) 1983. Ecosystems of the world. 4B. Mires: Swamp, bog, fen and moor. Regional studies. Elsevier Scientific Publishing Company, Amsterdam-Oxford-New York. Heathwaite, A.L. & Göttlich, Kh. 1993. Mires. Process, exploitation and conservation. John Wiley & Sons Ltd, Chichester. Joosten, H. & Clarke, D. 2002: Wise use of mires and peatlands - Background and principles including a framework for decision-making. International Mire Conservation Group and International Peat Society. Saarijärvi Offset Oy, Saarijärvi, Finland, 2002. 303 pp. ISBN 951-97744-8-3. Lugo, A.E., Brinson, M. & Brown, S. (eds.) 1990. Ecosystems of the world. 15. Forested wetlands. Elsevier Scientific Publishing Company, Amsterdam-Oxford-New York. Trettin, C.C., Jurgensen, M.F., Grigal, D.F., Gale, M.R. & Jeglum, J.K. (eds.) 1997. Northern Forested Wetlands: Ecology and Management. CRC Press, Lewis Publishers, Boca Raton-New York-London-Tokyo

**Evaluation:** Examination

#### **Special literature 2 (ME442) 3 credits**

84123

**Timing:** M.Sc. studies (5th year). (Master's Degree Programme studies, 2nd year).

**Responsible person:** Professor Vasander

**Contents:** Students practise analysing, organising and critically evaluating information from scientific reports.

**Realisation and working methods:** Lectures 0, practical work 0, group work 0, independent study 80 hours.

**Study materials and literature:** A set of texts (books and scientific articles) selected by agreement with the professor

**Evaluation:** Examination or a critical book review on a new international publication on peatland ecology

#### **Carbon and Nutrient Dynamics in Peatland Ecosystems (ME446) 5 credits**

84124

**Timing:** M.Sc. studies. Odd-numbered years in August

**Responsible person:** Prof. Vasander, Dr. Tuittila, Docent Laine and other teachers.

**Objective:** Student learns novel methods to study carbon and nutrient dynamics in

peatlands

**Contents:** Processes controlling carbon and nutrient dynamics in peatland ecosystems are studied by means of field measurements and monitoring. The course consists of field demonstrations and group work including both measurements of element fluxes and handling of the data. At the end of the course a field excursion will be taken to peatland sites in the aapa mire region.

**Realisation and working methods:** Practical work 133 hours. Field course

**It is possible to pass following courses also in English (see description under courses in Finnish):**

#### **Peat geology and technology (ME443) 3 credits**

84112

#### **The use of peat in Finland - Matching goals and conflicts (ME444) 3 credits**

84129

### **Courses in Finnish**

#### **Ecology of peatlands (ME342) 5 credits**

84128

**Timing:** B.Sc. studies

**Contents:** The systematics and ecology of mire vegetation, peat classification and identification (macro- and microscopically) and the relationships between mire plants and peat soil. Course includes a field excursion and practical exercises.

#### **Peat geology and technology (ME443) 3 credits**

84112

**Timing:** M.Sc. studies (4th-5th year). (Master's Degree Programme studies, 1st-2nd year).

**Responsible person:** Docent Raikamo

**Objective:** To give information on peatland and peat geology, peat accumulation, peat properties and use.

**Contents:** Peat and peatland geology, peat stratigraphy, peat properties and the industrial use of peat. Includes a field excursion.

**Realisation and working methods:** Lectures 20, practical work 30, group work 0, independent study 30 hours

**Evaluation:** Participation and examination

**Other information:** Finnish is the primary language of instruction, but English can be used as necessary.

**The use of peat in Finland - Matching goals and conflicts (ME444) 3 credits**

84129

**Timing:** M.Sc. studies (4th-5th year). (Master's Degree Programme studies, 1st-2nd year).

**Responsible person:** Professor Vasander

**Objective:** To get acquainted with the fundamental questions of peat use.

**Contents:** Peat use compared to peat stocks from the perspective of national and international energy and climate politics.

**Realisation and working methods:** Lectures 40, practical work 0, group work 20, independent study 20 hours

**Study materials and literature:** Literature is handed out during the course.

**Evaluation:** Examination

**Other information:** Finnish is the primary language of instruction, but English can be used as necessary.

**Resource management planning for peatlands (ME447) 5 credits**

84106

**Timing:** M.Sc. studies

**Contents:** This field course gives information on the ecology and environmental values of mires, and the forestry use of peatlands through forest amelioration. Students prepare a resource management plan concerning forest amelioration and/or restoration of a specific peatland site.

## Silviculture

As an applied field of science, silviculture combines the theory and practice of one key element of sustainable forest management, i.e. stand establishment, structure and growth. The ecological principles of the growth and development of individual trees and stands in different environmental conditions comprise the theoretical background for the studies. On the practical side, studies in silviculture will give the student a thorough knowledge of different silvicultural systems and pre- and post-harvest silvicultural actions needed to meet complex

and diverse management objectives of forest owners.

Studies in silviculture include courses in characterisation of forest site types, reproductive biology of trees, ecophysiology of trees, forest and stand development and growth, regeneration with natural and artificial methods, silvicultural systems and multiple uses of forests. Intermediate and advanced studies are recommended for those who are interested in ecological aspects of forest management and tropical forestry.

Students specialised in silviculture are employed by private non-industrial organisations, forest companies, international projects, and research and development agencies.

### Teaching staff

Professor Annikki Mäkelä

Professor Eero Nikinmaa

University Lecturer, Docent Timo Kuuluvainen

Docent Eero Kubin

Docent Kari Leinonen

Docent Markku Nygren

Researcher Pekka Nygren

## Courses in English

### Teaching events in WebOodi

**Structure, dynamics and biodiversity of boreal forests (ME222) 3 credits**

83556

**Timing:** B.Sc. studies (2nd year). (Master's Degree Programme studies, 1st year). The course is given in autumn term, period II.

**Responsible person:** University Lecturer Timo Kuuluvainen

**Objective:** The student will acquire basic knowledge of the natural structure and dynamics of boreal forests and their impacts on ecological biodiversity. The student will also learn to apply the knowledge in order to analyze the effects of forest management on biodiversity.

**Contents:** This course gives an overview of disturbances, succession and biodiversity in boreal forests on various spatial and temporal scales. Emphasis is on disturbances and successional processes as they occur in natural forests and how these dynamic processes act to maintain biological diversity. How to utilize the ecological knowledge about natural forests for ecologically sustainable forestry is also considered.

**Realisation and working methods:** Lectures 28, group work 30, independent study 22 hours  
**Study materials and literature:** D.B. Lindenmayer & Franklin, J.F. Conserving Forest Biodiversity. A Comprehensive Multiscaled Approach. Island Press. Other literature handed out during the course  
**Evaluation:** Participation, presentation of written and oral report, and final exam.

**Advanced literature (ME422) 5 credits**  
83518

**Timing:** M.Sc. studies (5th year). (Master's Degree Programme studies, 2nd year).

**Responsible person:** Professor Mäkelä

**Contents:** Practice in analysing, organising and critically evaluating information from scientific literature and reports.

**Realisation and working methods:** Lectures 0, practical work 0, group work 0, independent study 133 hours.

**Study materials and literature:** A set of texts (books and scientific articles) selected by agreement with the professor.

**Evaluation:** Examination

**Introduction to models of growth and yield dynamics (ME424) 4 credits**  
83664

**Timing:** M.Sc. studies (4th year). (Master's Degree Programme studies, 1st-2nd year). The course is given in the spring term in even-numbered years, period III.

**Responsible person:** Professor Mäkelä

**Relations to other study units:** ME107

**Objective:** The student is familiarized with models of forest growth and yield dynamics, their historical development, and current state.

**Contents:** The course gives an introduction to the history, development and current state of forest stand growth models based on production ecology. The students learn about the key theories underlying the models and about methods to quantify such theories. Implications of different hypothesis are analysed and the applicability of the models to forest management planning is assessed. The course includes problem solving and practicals.

**Realisation and working methods:** Lectures 28, practical work 28, independent study 56 hours.

**Study materials and literature:** Compilation of articles.

**Evaluation:** Exam and portfolio.

## Courses in Finnish

**Forest regeneration (ME220) 4 credits**  
835017

**Timing:** B.Sc. studies

**Contents:** General principles of natural regeneration and plantation silviculture; biological, economic and technical aspects of regeneration; evaluation of the regeneration results; use of different forest regeneration models to predict stand establishment and growth; environmental issues related to forest regeneration.

**Development, growth and yield of forests and stands (ME221) 4 credits**  
83544

**Timing:** B.Sc. studies

**Contents:** Natural succession of different types of forests and stand structures and their underlying development mechanisms; how stand management is based on functional characteristics of trees and how these principles are used in silvicultural practices for different management goals.

**Urban forestry (ME323) 5 credits**  
83605

**Timing:** B.Sc. studies

**Contents:** Urban forestry issues, including landscape management, are presented in lectures, field trips and practical exercises.

**Eco-physiological models describing metabolic function, transport and growth (ME324) 4 credits**  
830064

**Ecophysiology of trees I: gas exchange, transport and growth (ME325) 5 credits**  
83669

**Timing:** M.Sc. studies. Even years, period II.

**Contents:** The course introduces to basic metabolic processes in trees and their dependence on environmental factor. Students are taught how to estimate the effect of environmental factors on forest yield and growth.

**Seed and plant procurement in forestry (ME420) 5 credits**  
83514

**Timing:** M.Sc. studies

**Contents:** The principles and practices of forest tree seed and seedling production are covered in lectures, exercises and field excursions to

Department of Forest Ecology

nurseries and seed orchards. The course is arranged jointly with the University of Joensuu at the Suonenjoki Research Station of the Finnish Forest Research Institute.

**Silvics of Finnish Tree Species (ME423) 5 credits**

83638

Timing: M.Sc. studies

Contents: An overview of Finnish tree species and their silvicultural characteristics, structure, regeneration, growth and yield physiology.

"University of Helsinki Tropical Forestry Reports", with 27 issues completed as of 2005.

**Teaching staff**

Professor Olavi Luukkanen

University Lecturer Vesa Kaarakka

**Contact information**

PO Box 27

FIN-00014 University of Helsinki

Tel. +358 9 191 58 648

Fax +358 9 191 58 646

<http://www.mm.helsinki.fi/mmeko/vitri>

**Visiting address:**

Viikki A building (2nd floor)

Latokartanonkaari 9

## Tropical Silviculture

The Viikki Tropical Resources Institute (VITRI, formerly Tropical Silviculture Unit (TSU)), has provided training for about 70 Finnish forestry students in a tropical country, whereby Finnish forestry development projects have benefited. Development of national research organisations and training of local researchers in a number of countries have also been important achievements.

Strong institutional links are maintained, especially with Kasetsart University, Bangkok (Thailand); Chengdu Institute of Biology (Chinese Academy of Science), Nanjing Forestry University and Beijing Forestry University (China); and the Forests National Corporation, the Forestry Research Centre of the Agricultural Research Corporation and Faculty of Forestry, and the University of Khartoum (Sudan), as well as with the Tropical Agricultural Research and Higher Education Center CATIE (Costa Rica). Institutional contacts also exist with Indonesia, Malaysia, India, Ghana and Ethiopia.

VITRI acts as the national coordinator for Finland in the European Tropical Forest Research Network (ETFRN). The VITRI staff also work on national and international assignments related to tropical natural resources management and environmental and forest policy. The group, led by Dr. Olavi Luukkanen, Professor of Tropical Silviculture, currently consists of a lecturer in tropical silviculture, a project director, about 15 researchers or doctoral students as well as Finnish and international M.Sc. students specializing in tropical silviculture. The Unit publishes its own international journal,

## Courses in English

### Teaching events in WebOodi

**Agriculture and forestry in developing countries (ME350) 3 credits**

80053

Timing: B.Sc. studies (3rd year), period III.

Responsible person: Prof. Luukkanen

**Objective:** The student will become acquainted with the basic principles of tropical production and land use systems as well as the major international agreements and policy processes relevant to tropical forests, forestry and land use.

**Contents:** An introduction to tropical crop, livestock and forestry production systems and an overview of international environmental agreements, principles of land-use planning, agroforestry, environmental problems, human nutrition and food security.

**Realisation and working methods:** Lectures 42, independent study 38 hours.

**Study materials and literature:** Literature is given out during the course.

**Evaluation:** Exam in Finnish, Swedish or English on selected exam dates of the Faculty or based on separate agreement with Prof. Luukkanen.

**Tropical forest ecology and silviculture (ME351) 3 credits**

83533

Timing: B.Sc. studies (3rd year) period III.

Responsible person: Prof. Luukkanen

Relations to other study units: ME250 or

corresponding knowledge

**Objective:** The student will become acquainted with the ecological basis of forest management and the silvicultural systems used in tropical forests.

**Contents:** General principles of the biology, evolution and genetics of tropical trees, and using selected examples, major silvicultural systems and other tree-based production ecosystems, especially in natural forests.

**Realisation and working methods:** Lectures 36, practical work 14, independent study 30 hours.

**Study materials and literature:** Literature handed out during the course or the following literature can be used:

- Lamprecht, H. 1989. Silviculture in the tropics. GTZ, Eschborn. 296 p.
- and
- Luukkanen, O. 1984. Trooppisen metsänhoidon perusteet. Helsingin yliopiston metsänhoitotieteen laitoksen tiedonant. 49

or

- Evans, J. and Turnbull, J. W. 2004. Plantation Forestry in the Tropics. The role, silviculture and use of planted forests for industrial, social, environmental and agroforestry purposes. 3rd ed. Oxford University Press.

**Evaluation:** Exam in Finnish, Swedish or English on selected exam dates of the Faculty or based on separate agreement with Prof. Luukkanen.

**Other information:** Most of the lectures will be given in Gardenia.

**Seminar: Agriculture and forestry in developing countries (ME450) 3 credits**  
83546

**Timing:** M.Sc. studies (4th year) period III.

**Responsible person:** Prof. Luukkanen, University Lecturer Kaarakka

**Objective:** The students learn to prepare and present a seminar report based on the utilisation of scientific reference material.

**Contents:** The students prepare and present a written 10-page report in English on forestry, agriculture, agroforestry or other relevant topic. A selection of seminar topics will be provided, but a topic can also be selected according to the participant's own interest.

**Realisation and working methods:** Lectures 28, independent study 52 hours.

**Evaluation:** Presentation of the report and participation to 80% of the seminar sessions.

**Field course: Tropical forest ecology and silviculture (ME451) 5 credits**

83541

**Timing:** B.Sc./M.Sc. studies, 3rd or 4th year. Offered in even-numbered years.

**Responsible person:** Prof. Luukkanen and University Lecturer Kaarakka

**Relations to other study units:** Prerequisites: ME 350, ME 351, ME 452 or corresponding knowledge

**Objective:** The students familiarise themselves with the basic methodologies of ecological field research and principles of socio-economic field research.

**Contents:** Arranged as a joint Thai-Nordic course at Kasetsart University, Bangkok, and field stations elsewhere in Thailand. Covers the ecology, management and conservation of natural and man-made production ecosystems (including agroforestry and estate crops); ecophysiology of tropical trees; tree uses, including non-wood forest products; deforestation and forest rehabilitation; and forest and land-use policy.

**Realisation and working methods:** Practical work 133 hours.

**Evaluation:** Participation and group work

**Other information:** This course is arranged in Thailand. Prospective participants are urged to apply for personal scholarships.

**Special topics on silviculture in developing countries (ME452) 2-3 credits**

83536

**Timing:** B.Sc. / M.Sc. studies, 3rd or 4th year. Offered in odd-numbered years. period II.

**Responsible person:** Prof. Luukkanen and University Lecturer Kaarakka

**Relations to other study units:** Prerequisites: ME 350, ME 351 or corresponding knowledge

**Objective:** Students are introduced to ecology, development problems and culture of South-East Asia with particular reference to Thailand.

**Contents:** Lectures and seminars on forestry, development problems and culture in South-East Asia, especially Thailand. Aimed primarily at participants preparing themselves for the ME451 field course, but other students can also participate.

**Realisation and working methods:** Lectures 10, practical work 50, group work 10, independent study 56 hours

**Evaluation:** Participation and/or report

**Agroforestry in the tropics and developing countries (ME454) 5 credits**  
83554

**Timing:** M.Sc studies, (4th year) period IV.

**Responsible person:** Dr. Elfadl

**Relations to other study units:** Prerequisites: ME150, ME350 or corresponding knowledge

**Objective:** Students familiarise themselves with and can recognise the major agroforestry systems of the tropics and developing countries.

**Contents:** Ecological, technical, economic and social aspects of agroforestry systems and practices in the tropics and developing countries. Analyses and synthesis of the major practices. Theoretical models and research methods of these production systems.

**Realisation and working methods:** Lectures 42, group work 20, independent study 71 hours.

**Evaluation:** Exam (after the lectures or based on separate agreement with Dr Elfadl) in English

**Workshop: National Forest Programmes (ME455) 5 credits**  
83557

**Timing:** M.Sc. studies, 4th or 5th year. Offered in odd-numbered years, period III (intensive course).

**Responsible person:** Prof. Luukkanen

**Relations to other study units:** Prerequisites: ME250, ME351 or corresponding knowledge

**Objective:** The students are familiarised with global environmental and forest policies and related conventions and agreements.

**Contents:** The major global environmental and forest policies as well as related conventions and agreements are presented. The national forest programme (NFP) processes will be analysed at the international and national level. Special attention is given to poverty reduction strategies and their linkages with forest-sector planning. The course consists of lectures and group work on individual countries and crosscutting issues.

**Realisation and working methods:** Lectures 40, group work 50, independent study 40 hours.

**Study materials and literature:** Literature and other materials handed out during the course.

**Evaluation:** Participation, group work and exam. The course will end in a final examination that can be taken in English, Finnish, Swedish, Danish or Norwegian.

**Other information:** This course is arranged within the Nordic Veterinary Agricultural and Forestry University (NOVA) framework.

**Seminar: Tropical silviculture research (ME456) 3 credits**  
83629

**Timing:** M.Sc. studies, 4th or 5th year period I.

**Responsible person:** Prof. Luukkanen, University Lecturer Kaarakka

**Relations to other study units:** ME350, ME351, ME450, ME451 or corresponding knowledge

**Objective:** The students familiarise themselves with research conducted on tropical forestry at VITRI and present their own research work. Students strengthen their ability to prepare and present a scientific report.

**Contents:** Participants present their own research for M.Sc. / Ph.D. thesis. Students who have completed their data collection for a M.Sc. thesis are particularly urged to participate, but doctoral and other students are also welcome.

**Realisation and working methods:** Lectures 14, practical work 0, group work 0, independent study 66 hours.

**Evaluation:** Presentation of the report and participation to 80% of the seminar sessions. Those who give a presentation in ME 456 do not need to repeat it in ME 404 (Pro Gradu seminar) coordinated by Prof. Annikki Mäkelä. Attendance in the other programme of ME 404 is, however, strongly recommended.

**Participatory methods in sustainable management of natural resources (ME457) 5 credits**  
83633

**Timing:** M.Sc. studies, (4th year), period I.

**Responsible person:** University Lecturer Kaarakka

**Relations to other study units:** Prerequisites: ME 350, ME 351 or corresponding knowledge

**Objective:** Students are familiarised with participatory methods and their applications in sustainable management of forests and other natural resources in developing and developed countries.

**Contents:** Lectures on participation, participatory methods and approaches, stakeholder analysis, community-based management of natural resources, conflicts and conflict management. Examples and case studies of developed and developing countries are also presented.



Group works on selected tasks. Field visits in the Helsinki metropolitan area on public and/or private forest management and community-based natural resources management.

**Realisation and working methods:** Lectures 28, practical work 20 h, group work 20 h, independent study 65 hours.

**Evaluation:** Group work, participation in field visits and exam. Exam, in Finnish, Swedish or English is taken after the last lecture or by agreement with Dr. Kaarakka.

**Tropical Silviculture, advanced literature (ME458) 5 credits /3cu**

830063

**Timing:** M.Sc. studies, 4th or 5th year

**Responsible person:** Prof. Luukkanen

**Objective:** The student is acquainted with a special topic/topics in tropical ecology, silviculture, agroforestry or land use.

**Realisation and working methods:** Independent study.

## Courses in Finnish

**Forests of the world (ME250) 2 credits**

83509

**Timing:** Recommended in the 2nd year, period II.

**Contents:** Main vegetation zones of the earth, and their ecologically and economically important tree species as well as the features of forestry in selected countries and regions.

**International Forestry (ME251) 2-5 credits**

83635

**Timing:** B.Sc. studies. Recommended in the 2nd or 3rd year.

**Contents:** The course can be taken as a literature exam and/or by preparing a written report on work, practical training or study tour abroad.

## Forest Pathology

Forest Pathology is the branch of plant pathology that deals with diseases of woody plants growing in natural forests, plantations, tree nurseries, and in urban environments. As a science, it is one of many crop-oriented divisions of plant pathology that are collectively dedicated to understanding the nature of disease in plants.

As an art, it is a discipline in forestry serving the public interest by applying scientific principles to the prevention and control of tree diseases. Of the biotic diseases, fungal diseases are the most important in conditions similar to those in Finland, whereas diseases caused by bacteria and viruses are of less importance. In addition to diseases of living trees, protection of woody products and building constructions against pests (primarily fungi) is included in the discipline. Of abiotic factors, diseases and disorders caused by air pollution and by climatic and edaphic factors are of major importance.

### Teaching staff

Professor Risto Kasanen

Docent Antti Uotila

### Contact information

Department of Applied Biology

P.O. Box 27

FIN-00014 University of Helsinki

Finland

tel. +358 9 191 58 377

risto.kasanen@helsinki.fi

## Courses in English

### Teaching events in WebOodi

**Epidemiology and ecology of plant pathogens (KPAT401/ME460) 5 credits**

81331

**Timing:** M.Sc. studies. **period I**

**Responsible person:** Risto Kasanen

**Relations to other study units:** ME204, MPAT1, MPAT4

**Objective:** To understand the factors and processes behind plant disease epidemics in forest and agricultural ecosystems.

**Contents:** Basic epidemiology and examples. The biological background for epidemics, risk assessment, epidemiological mechanisms, modelling.

**Realisation and working methods:** Lectures 30, practical work 10, independent study 70 hours.

**Evaluation:** Examination

**Other information:** Previously MPAT31.

**Bacteria, viruses and diagnostics of pathogens (ME461) 5 credits**

81334

**Timing:** M.Sc. studies

**Responsible person:** Risto Kasanen

**Contents:** Information on the identification, biology, spread and control of bacteria and viruses causing plant diseases. See also description for KPAT403.

**Other information:** This course is integrated from courses MPAT51 and MPAT52. Teaching in Finnish or in English.

**Tropical forest pathology (ME462) 3 credits**

81432

**Timing:** M.Sc. studies. This course is given only if there is sufficient demand.

**Responsible person:** Risto Kasanen

**Relations to other study units:** ME260-ME461 (MPAT1-MPAT52)

**Contents:** Forest, agroforestry and nursery pathology in subtropical and tropical regions. Aspects of legislation and quarantine regulations in tropical forest protection.

**Realisation and working methods:** Lectures 18, practical work 8, independent study 54 hours.

**Evaluation:** Examination 90% and project report.

**Other information:** Previously MPAT24.

**Literature (ME466) 5 credits**

81412

**Timing:** M.Sc. studies.

**Responsible person:** Risto Kasanen

**Relations to other study units:** ME260-ME463 (MPAT1- MPAT6)

**Contents:** An exam review and exam based on selected literature related to forest pathology.

**Realisation and working methods:** Lectures 0, practical work 0, group work 0, independent study 133.

**Evaluation:** Examination

**Other information:** Previously MPAT11. In English or in Finnish.

**Plant-microbe interactions and molecular defence of plants (ME560) 10 credits**

81332

**Timing:** M.Sc. studies. II period

**Responsible person:** Prof. Risto Kasanen

**Relations to other study units:** ME206, ME361, ME460, ME463

**Objective:** To understand interactions between

plants and their pathogens and symbionts at the molecular level.

**Contents:** The biology of pathogen infections, plant defence responses and symbiotic interactions at the molecular level. The course includes laboratory work sessions.

**Realisation and working methods:** Lectures 30, practical work 80, independent study 90 hours.

**Study materials and literature:** Will be given during the course.

**Evaluation:** Examination

**Other information:** Previously MPAT301. See course home page at <http://www.mm.helsinki.fi/mmsbl/Kpat/cppe/>

**Courses in Finnish**

**Basics of forest pathology (ME260) 6 credits**

81415

**Timing:** B.Sc. studies

**Contents:** The biology of biotic tree diseases and the causes of abiotic diseases. The course includes laboratory work sessions.

**Biodiversity and systematics of pathogens in forest trees (ME361) 6 credits**

81404

**Timing:** B.Sc. studies

**Contents:** Systematics of fungal forest pathogens. The biology, distribution and control of forest pathogens occurring in Finland. Laboratory work sessions, which include personal collection of the specimen of the pathogens and symptomatic plants.

**Other information:** Previously MPAT4. In Finnish or in English.

**Practicals in advanced forest pathology (ME463) 8 credits**

81406

**Timing:** M.Sc. studies

**Contents:** The course is based on laboratory work sessions highlighting various methods used in studies related to tree pathogens. Matters related to research planning as well as writing a scientific report are also included.

**Special course in forest pathology (ME464) 2 credits**

81424

**Timing:** M.Sc. studies

**Contents:** The contents of this course vary from year to year, but usually given on a current topic.

**Additional studies in forest pathology (ME465)**

81433

**Timing:** M.Sc. studies

**Contents:** Other additional studies in forest pathology. The credits can be given for studies completed at other universities, international courses, etc. The actual number of credits should be discussed with the professor of forest pathology.

## Forest Tree Breeding

Forest Tree Breeding involves primarily natural science applications, of which genetics is central. Students of forest tree breeding must have an interdisciplinary education and they are able to specialise in the biological sciences or in seed and plant supply and trade.

As diversity of forests has become more and more important, forest tree breeding is broadening to include, among other things, noble broadleaf trees and other rare trees that are of importance in landscape management and in the expanding wood products industries. These rare trees play an important role in providing quality seed in forest tree breeding.

Basic elements in forest tree breeding are good dendrological skills and a firm ecological knowledge of forest management. Forest tree breeding in Finland enjoys an excellent international reputation.

Students can combine study modules in forest ecology and new methodologies of biotechnology with studies in forest tree breeding.

**Teaching staff**

Professor Teemu Teeri  
Assistant teacher N.N.

**Contact information**

Department of Applied Biology  
P.O. Box 27  
FIN-00014 University of Helsinki  
Finland

Tel. +358 9 1911

Fax +358 9 191 58 434

Internet: <http://mm.helsinki.fi/mmkab/>

**Course descriptions under Department of Applied Biology/Plant Breeding**

## Forest Zoology

Forest Zoology applies zoology to forestry. Forest Zoology focuses on the protection of forests from damage caused by animals, mainly by analysing the ecological mechanisms behind forest damage. The study courses concentrate on the recognition of pest species and their damage, the estimation of the scale and quality of damage, pest management, and pest forecasts. Since forest management profoundly affects the entire forest fauna, maintaining biodiversity and conserving endangered forest insects are additional important areas of research and education in forest zoology.

**Teaching staff**

Professor Kari Heliövaara  
Docent Erkki Annala  
Docent Risto Heikkilä  
University Lecturer Päivi Lyytikäinen-Saarenmaa  
Docent Kari Löyttyniemi  
Docent Mikko Peltonen  
Docent Hannu Saarenmaa

**Contact information**

Department of Applied Biology  
P.O. Box 27  
FIN-00014 University of Helsinki  
Finland  
Tel. +358 9 1911  
Fax +358 9 191 58463  
<http://mm.helsinki.fi/mmsbl/english/index.htm>

## Course in English

**Teaching events in WebOodi**

**Forest Protection and Wildlife Management (ME475) 5 credits**

830062

**Timing:** Master's Degree Programme studies,

## Department of Forest Ecology

1st-2nd year. The course is given in spring term, period IV period.

**Responsible person:** Professor Heliövaara

**Objective:** To equip the student with a basic understanding of the various aspects of forest protection and wildlife in the boreal forest zone.

**Contents:** Forest protection and wildlife, basic forest pathology, basic forest zoology, basic game management, current national and international themes. Special emphasis on boreal forest ecosystems.

**Realisation and working methods:** Includes lectures, literature and a field trip.

**Study materials and literature:** Literature handed out during the course.

**Evaluation:** Examination

**Other information:** The course is specifically intended for international students interested in the topic. It can also be incorporated into the Master's Degree Programme in Forest Sciences and Business. This course cannot be substituted for forest zoology and pathology lectures/ field exercises arranged within the courses ME101/ME105.

### **Insect ecology (ME472) 3 credits**

83111

**Contents:** Course covers concepts in ecology applied to entomology at the individual, population, community and ecosystem levels. Course includes examples from both agricultural and forest entomology as well as from natural systems.

### **Entomology (ME473) 4 credits**

83200

**Contents:** Characteristics of insects and entomology with special reference to insect morphology, systematics, ethology and physiology in applied entomology

### **Special courses in applied entomology (ME474) 2-9 credits**

83207

**Contents:** Separate courses on different topics, e.g. herbivory, theoretical and applied population dynamics, integrated pest management, biodiversity, etc. The course includes selected literature (3 credits).

## **Courses in Finnish**

### **Fundamentals of forest zoology (ME270) 5 credits**

83202

**Contents:** The recognition of forest pests, understanding the mechanisms behind damage, and solving forest pest problems. The course includes species identification (level I).

### **Forest entomology 1 (ME470) 6 credits**

83204

**Contents:** The ecological and silvicultural background of insect pest outbreaks. The course includes practical exercises, e.g. on pest forecasting.

### **Forest entomology 2 (ME471) 8 credits**

83211

**Contents:** Familiarity with a specialized branch of forest entomology by studying the latest literature and preparing a personal insect collection. The course includes species identification (level III).

## **Wildlife Management**

Wildlife Management focuses on the ecology and management of game animals, as well as on applied issues relating to other terrestrial vertebrates. The aim of wildlife management is to study the extent to which the requirements of animals are balanced with the need to manage forests, wetlands and agricultural land. Employment opportunities for wildlife managers are generally in environmental administration and research.

### **Teaching staff**

Professor Kari Heliövaara  
University Lecturer Petri Nummi  
Veli-Matti Väänänen, PhD

### **Contact information**

Department of Applied Biology  
P.O. Box 27  
FIN-00014 University of Helsinki  
Finland  
Tel. +358 9 1911  
Fax +358 9 191 58463  
<http://mm.helsinki.fi/mmsbl/english/index.htm>

## **Courses in Finnish**

### **Basics of wildlife management (ME290) 3 credits**

83301

**Contents:** The basics of ecology and management of Finnish game species, including cervids, fur game, waterfowl and grouse.

### **Field course on wildlife research and management (ME291) 2 credits**

83302

**Timing:** B.Sc. studies

### **Identification of birds and mammals 1 (ME292) 2 credits**

83306

### **Identification of Birds and Mammals II (ME293) 3 credits**

830001

### **Hunting (ME294) 3 credits**

83303

**Timing:** B.Sc. studies

### **Methods in wildlife management (ME295) 3 credits**

83318

**Timing:** B.Sc. studies

### **Postmortem analysis and taxidermy of game (ME296) 2 credits**

83307

**Timing:** B.Sc. studies

### **Pest Vertebrates (ME298) 3 credits**

83219

**Timing:** B.Sc. studies

### **Literature (ME390) 6 credits**

83319

**Timing:** B. Sc. studies

### **Special Practical Training (ME490) 2 credits**

83312

**Timing:** M.Sc. studies

### **Specialized literature (ME491) 9 credits**

83322

**Timing:** M.Sc. studies

### **Specific topics on wildlife management (ME492) 12 credits**

83310

**Timing:** M.Sc. studies

## DEPARTMENT OF FOREST ECONOMICS

Studies at the Department of Forest Economics provide an approach to the forest sector through economic planning, management and marketing, and place emphasis on theoretical knowledge and methodical skills as well as on their practical application. Growing emphasis is also placed on management and economic skills. The strength of this degree programme lies in its close links to the other forestry disciplines, and a competitive advantage is achieved through an ecological orientation and a broad knowledge of the forest sector. Internationalisation is one of this programme's main features of the studies.

In teaching, emphasis is placed on:

- A scientific approach
- Economic thinking
- Ecological consciousness and environmental values
- Abilities in leadership, co-operation and communication

At the Department of Forest Economics, students choose between two majors: Forest Economics and Forest Products Marketing. In Forest Economics, students can specialise in one of two specialisation lines, Forest Economics and Management or Forest Economics and Policy, at the beginning of their M.Sc. studies.

### Head of the Department

Professor Jari Kuuluvainen

### Contact information

PO Box 27 (Latokartanonkaari 7)  
FIN-00014 University of Helsinki  
E-mail: ForEcon@Helsinki.fi  
Tel. +358 9 191 57968  
Fax +358 9 191 57984

## Forest Economics

### Forest Economics and Policy

Forest Economics and Policy studies economic and social phenomena related to forestry and the forest industry. These phenomena are examined on the level of individual actors, the industry sector and the national economy. National and international forest policy issues are also studied. The main educational objective of this major is to educate forest economists who are familiar with the theories and applications of forest economics, natural resource economics and environmental economics. Students acquire skills that will enable them to fulfil a broad range of tasks in Finland or abroad in both the private and public sector.

### Forest Economics and Management

Forest Economics and Management concerns itself with managerial economic questions in forest estates and forest industries. These include the economics of forest management and silviculture as well as managerial issues in wood procurement and industrial wood processing. Research in Forest Economics and Management focuses on enterprises in the forestry sector. This includes firms that own forests, process forest products or provide services related to forests. In addition, individual forest owners and farms are studied as a special enterprise category. Main research methods are accounting, simulation and optimisation.

The Department of Forest Economics also provides teaching in private forestry. Courses in private forestry cover the characteristics of Finnish non-industrial private forest owners and their forest holdings, their ownership objectives and forest management behaviour as well as the timber supply from private forests. These features are analysed in connection with related forest policy and from the point of view of social sustainability. A perspective on private forestry in other industrialised countries is also provided. The approach is mainly behavioural scientific.

### Teaching staff

Professor Heimo Karppinen  
Professor Jari Kuuluvainen  
Professor Lauri Valsta  
University Lecturer Mika Rekola  
Assistant Emmi Haltia

## REQUIREMENTS FOR THE BACHELOR'S DEGREE, 180 CREDITS Common to both specialisation lines

### GENERAL STUDIES

MMEKN100	Introduction to Studies in Forest Science, 2 cr
ME101	Basics of Forest Ecology and Silviculture, 3 cr
MARV1	Basics of Forest Mensuration and Management, 9 cr
METEK11	Basic Forest Technology, 3 cr
METEK12	Basic Training in Forest and Wood Technology, 3 cr
PTEK20	Bases of Wood Technology, 6 cr
YE19A	Introduction to Mathematics I, 3 cr
YE19B	Introduction to Mathematics II, 3 cr
Y125	Basic Course in Research, 2 cr
Y130	Basics of Statistical Inference, 5 cr
Y60	Commercial Law, 4 cr or Y85 Land and Water Law, 4 cr
MMEKN101	Personal Study Plan (B.Sc.), 2 cr

### MAJOR STUDIES

#### Basic studies

FEC110	Introduction to Forest Economics, 8 cr
FPM1	Basic Course in Forest Products Marketing, 3 cr
Y55	Basic Course in Economics, 10 cr
Y145	Basics of Accounting, 4 cr

#### Intermediate studies

Y56	Advanced Microeconomic Theory, 11 cr
Y75	Managerial Accounting, 5 cr
Y105	Basic Course in Marketing, 5 cr
EE047	Organizational Behaviour, 5 cr
MAL15	Econometrics I, 6 cr
MMEKN120	Ethics and Social Responsibility in the Forest Sector, 3 cr
FEC120	Fundamentals of Forest Economics, 10 cr
FEC180	Research Seminar (B.Sc.), 3 cr
FEC190	Bachelor's Thesis, 6 cr Maturity Essay

### LANGUAGE STUDIES AND STUDIES IN INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)

	Second domestic language, 4 cr
	Two foreign languages, 6 cr
	ICT driving licence, 3 cr
FPM16	Business and Economic Finnish, 5 cr
	One business language course, 7 cr

### OTHER STUDIES

MMEKN110	Career Planning, 1 cr
----------	-----------------------

### MINOR STUDIES, 25 CREDITS

### FREE-CHOICE STUDIES, 8 CREDITS

## REQUIREMENTS FOR THE MASTER'S DEGREE, 120 CREDITS Specialisation line: Forest Economics and Management

### GENERAL STUDIES

Y126	Basic Course in Research 2, 2 cr
Y131	Statistical Models 1, 5 cr
FEC201	Personal Study Plan (M.Sc.), 1 cr

### MAJOR STUDIES

#### Advanced studies

FEC210	Advanced Forest Economics, 4 cr
FEC270	Special Practical Training, 2 cr
FEC280	Thesis Seminar, 5 cr
FECP210	Econometrics II, 6 cr or FECP220 Introduction to Methods of Social Sciences, 6 cr
FECP210	Quantitative Methods in Forest Resource Management, 5 cr
FECP280	Essays, 3 cr

Department of Forest Economics

FECM290 Master's Thesis, 40 cr  
Maturity Essay

At least 24 credits from the following courses:

FECM220 Economics of the Timber Industry, 5 cr  
FECM230 Business Strategy and Management Simulations, 5 cr  
FECM260 Special Topics in Forest Economics and Management, 3-7 cr  
FECM270 Literature, 5 cr  
FECP271 Private Forestry and Forest Policy, 3 cr  
METEK14 Methods of Logging and Wood Transport, 6 cr  
EE037 Financial Planning and Management, 8 cr  
LOG1 Basics of Logistics, 3 cr

**LANGUAGE STUDIES AND STUDIES IN INFORMATION AND COMMUNICATION TECHNOLOGY (ICT), 1 CREDIT**

**FREE-CHOICE STUDIES, 23 CREDITS**

**REQUIREMENTS FOR THE MASTER'S DEGREE, 120 CREDITS**  
**Specialisation line: Forest Economics and Policy**

#### **GENERAL STUDIES**

Y126 Basic Course in Research 2, 2 cr  
Y131 Statistical Models 1, 5 cr  
FEC201 Personal study plan (M.Sc.), 1 cr

#### **MAJOR STUDIES**

##### Advanced studies

FEC210 Advanced Forest Economics, 4 cr  
FEC270 Special Practical Training, 2 cr  
FEC280 Thesis Seminar, 5 cr  
FECP210 Econometrics II, 6 cr  
or FECP220 Introduction to Methods of Social Sciences, 6 cr  
FECP230 Forest Policy Analysis, 6 cr  
FECM210 Quantitative Methods in Forest Resources Management, 5 cr  
FECP280 Essays, 3 cr  
FECM290 Master's Thesis, 40 cr  
Maturity essay

At least 18 credits from the following courses:

FECP210 Econometrics II, 6  
FECP220 Introduction to Methods of Social Sciences, 6 cr  
FECP240 International Forest Policy, 3 cr

FECP250 Valuation of Environmental Benefits, 3 cr

FECP260 Special Topics in Forest Economics and Policy, 3-7 cr

FECP270 Literature, 5 cr

FECP271 Private Forestry and Forest Policy, 3 cr

YE3 Intermediate Environmental Economics, 8 cr

YE11 Cost-Benefit Analysis, 4 cr

ME455 Workshop: National Forest Programmes, 5 cr

**LANGUAGE STUDIES AND STUDIES IN INFORMATION AND COMMUNICATION TECHNOLOGY (ICT), 1 CREDIT**

**FREE-CHOICE STUDIES, 23 CREDITS**

#### **Courses in English**

Teaching events in WebOodi

**Personal Study Plan (M.Sc.) (FEC201)**  
**1 credit**

837009

**Timing:** At the beginning of studies toward the Master's degree

**Responsible person:** Professor Jari Kuuluvainen and Professor Lauri Valsta

**Objective:** To prepare a personal study plan for completing the Master's degree. Alternatively, to update the personal study plan for completing the Bachelor's degree in line with completing the Master's degree.

**Contents:** Planning the studies for completing the Master's degree. General career planning.

**Realisation and working methods:** Independent study 27 hours

**Evaluation:** Written plan, pass/fail.

**Advanced Forest Economics (FEC210)**  
**4 credits**

837015

**Timing:** Autumn term, period I.

**Responsible person:** Docent Jussi Uusivuori

**Relations to other study units:** Prerequisites: YE19, Y55, Y56; for students majoring in forest economics, FEC110 and FEC120 or corresponding courses.

**Objective:** The student becomes familiar with formal problem formulation in forest economics and understands the connection between the assumptions and the structure of a theoretical



economic model and the derived theoretical results and hypotheses for empirical testing.

**Contents:** The rotation model for even-aged stands, age class models and the Fisherian consumption-savings model with biomass harvesting. In situ value of forest.

**Realisation and working methods:** Lectures 14, practical work 8, independent study 85 hours

**Study materials and literature:** Provided in the lectures

**Evaluation:** Exam and assignments.

### **Special Practical Training (FEC270) 2 credits**

837017

**Responsible person:** Professor Jari Kuuluvainen or Professor Lauri Valsta

**Objective:** An introduction to working relating to the forest sector.

**Contents:** The training period (internship) can take place in firms, research institutes or other organisations. It can be taken starting from the first year of Master's degree studies, possibly abroad. Traineeships are usually arranged by students themselves. The details of the traineeship must be agreed upon beforehand with Professor Kuuluvainen or Professor Valsta. Students write a report on the training period according to the instructions available at the department.

**Realisation and working methods:** Independent study 53 hours

**Evaluation:** Written plan, pass/fail.

### **Thesis Seminar (FEC280) 5 credits**

837016

**Timing:** Beginning session: Autumn term, period I.

**Responsible person:** Professor Jari Kuuluvainen and Professor Lauri Valsta

**Relations to other study units:** Prerequisites: FEC120, FEC180, Y126, Y130 and Y131 or corresponding courses.

**Objective:** The seminar trains the student in the writing and oral presentation of a research plan.

**Contents:** Each participant presents the research plan of his/her Master's thesis. The participants are actively involved in the discussion and criticism of other students' written and oral presentations (5 credits). Optional: Students can earn additional 1-2 credits by participating in a scientific seminar. A short report on the seminar

is required. The appropriate seminar and the length of a report must be agreed upon with Professor Kuuluvainen or Professor Valsta.

**Realisation and working methods:** Lectures 12, independent study 122 hours

**Evaluation:** Pass/Fail.

**Other information:** Instructions for writing a scientific presentation: See department's website on the intranet Alma.

### **Research Seminar (FEC380) 1 credit**

837018

**Timing:** Annually

**Responsible persons:** Professor Jari Kuuluvainen and Professor Lauri Valsta

**Objective:** To provide doctoral students in Forest Economics an opportunity to discuss their current research topics and receive feedback.

**Contents:** Participants' seminar presentations.

**Realisation and working methods:** Lectures 12, independent study 15 hours

**Evaluation:** Pass/Fail.

### **Quantitative Methods in Forest Resource Management (FECM210) 5 credits**

83716

**Timing:** Spring term, period IV. Offered every other year starting in 2008.

**Responsible person:** Professor Lauri Valsta

**Relations to other study units:** Prerequisites: Y115 or corresponding knowledge.

**Objective:** The student analyses economic issues in forest resource management utilising quantitative methods and learns to use spreadsheets in solving management problems.

**Contents:** Management of even- and uneven-aged stands and forests; consideration of biodiversity; study of probabilistic models.

**Realisation and working methods:** Lectures 28, practical work 12, independent study 93 hours

**Study materials and literature:** Buongiorno, J. and Gilles, K. J. 2003. Decision Methods for Forest Resource Management. Academic Press.

**Evaluation:** Assignments and exam.

### **Economics of the Timber Industry (FECM220) 5 credits**

83717

**Timing:** Spring term, period IV. Offered every other year starting in 2007.

**Responsible person:** Professor Lauri Valsta

**Relations to other study units:** Prerequisites: Y75 and Y145 or corresponding courses.

**Objective:** The student learns managerial approaches to problems in the timber industry.

**Contents:** Managerial accounting and finance, investments in the timber industry, technological development.

**Realisation and working methods:** Lectures 20, practical work 10, independent study 103 hours

**Evaluation:** Assignments.

**Special Topics in Forest Economics and Management (FECM260) 3-7 credits**

83726

**Timing:** To be announced.

**Responsible person:** Professor Lauri Valsta

**Contents:** Current issues in forest economics and management to complement the student's previous studies.

**Other information:** Reading and conference based on an individual plan.

**Literature (FECM270) 5 credits**

83719

**Responsible person:** Professor Lauri Valsta

**Objective:** The student will gain an in-depth understanding of the theories and problems in forest economics and management.

**Contents:** Literature exam (5 cr.), usually in 2 parts. Books and schedule to be agreed upon with Professor Valsta.

**Realisation and working methods:** Independent study 133 hours

**Study materials and literature:** By agreement

**Evaluation:** Final exam

**Essays (FECM280) 3 credits**

83724

**Responsible person:** Professor Lauri Valsta

**Objective:** Training in the use of professional language and written expression.

**Contents:** The student prepares two essays, one of which is based on Master's thesis. Topics and the language in which the essays are written should be agreed upon with Professor Valsta.

**Realisation and working methods:** Independent study 80 hours

**Evaluation:** Pass/Fail.

**Master's Thesis (FECM290) 40 credits**

83725

**Responsible person:** Professor Lauri Valsta

**Objective:** To learn how to plan, conduct and

report on an independent research project.

**Realisation and working methods:** Independent study 1068 hours

**Econometrics II (FECP210) 6 credits**

83041

**Timing:** Autumn term, period II.

**Responsible person:** Professor Jari Kuuluvainen and Docent Anne Toppinen

**Relations to other study units:** Prerequisites: MAL 15 or corresponding course

**Objective:** To familiarise the student with the basic methods of econometrics in forest and agricultural economics and in valuing non-market benefits.

**Contents:** Ordinary Least Squares. A focus on cross-section and panel-data econometrics in 2006. A focus on time series econometrics in 2007.

**Realisation and working methods:** Lectures 14, practical work 14, independent study 132 hours

**Evaluation:** Exercises (20%) and final exam (80%).

**Introduction to Methods of Social Sciences (FECP220) 6 credits**

83042

**Timing:** Autumn term.

**Responsible person:** Alvar (Sami) Berghäll

**Relations to other study units:** Prerequisites: Y130

**Objective:** The course aims to provide a comprehensive basic understanding of how modern quantitative social research is carried out and applied to forest economics.

**Contents:** The course begins with a course exam on the literature. Enrolees who pass this examination will do group work in pairs, and practice in carrying out a survey research project using a learning-by-doing approach. The work starts with discussion and preparation of a theoretical frame of reference and a research plan on a given case based on real data as well as familiarisation with the statistical analysis program SPSS. After the lectures each group prepares a research report (a miniature Master's thesis) under the personal guidance of the instructor, who also provides the topic and the data. (Those already having a M.Sc. thesis topic can work with their topic and related data.) The reports should be completed by the beginning of December, but first drafts should be ready by the middle of November. The course ends in

December with two seminar sessions. In these researcher colloquiums, each group presents the work it has done in the style of a researcher reporting her/his results to a scientific congress (attendance obligatory).

**Realisation and working methods:** Lectures 18, practical work 82, group work 40, independent study 20 hours

**Study materials and literature:** Bailey, K. D. 1987 or newer edition. Methods of social research, excluding part 3 (pp. 217-336). New York Free Press.

**Evaluation:** Pass/fail, based on the examination of literature, SPSS skills assessment and an approved case report.

**Other information:** In connection with FPM26. This version of the course is for FEC majors. The course utilises WebCT as a virtual working environment.

#### **Forest Policy Analysis (FEC230) 6 credits** 83043

**Timing:** Spring term.

**Responsible person:** Professor Jari Kuuluvainen and University Lecturer Mika Rekola

**Relations to other study units:** Prerequisites: FEC120 or corresponding course; students majoring in forest economics FEC210 or FEC220.

**Objective:** To give students the tools for forest policy analysis.

**Contents:** Economic foundations of forest policy, private and social preferences, externalities and market failures; evaluating the effectiveness of forest policy; forest legislation; forest taxation and subsidies; timber supply and nonindustrial forest owner behaviour. Theoretical models and their connection to the empirical analysis in forest economics and forest policy.

**Realisation and working methods:** Lectures 42, group work 10, independent study 108 hours

**Study materials and literature:** Provided in the lectures.

**Evaluation:** Exercises and essays.

**Other information:** Lectures include written assignments and presentations on the course material.

#### **International Forest Policy (FEC240)** **3 credits** 83048

**Timing:** To be announced.

**Responsible person:** To be announced.

**Objective:** To familiarise the students with international forest policy.

**Contents:** International conventions related to forestry: UNFF, MCPFE, UNFCCC, UNCCD, CBD. Themes will include good governance practices and forest certification.

**Evaluation:** Exam and assignments.

#### **Valuation of Environmental Benefits (FEC250) 3 credits** 83049

**Timing:** Autumn term, period I. Offered every other year starting in 2007.

**Responsible person:** University Lecturer Mika Rekola

**Relations to other study units:** Prerequisites: YE3, FEC110 or corresponding courses. Admission to the course requires successful completion of the literature pre-test.

**Objective:** To familiarise the student with the valuation of environmental benefits.

**Contents:** Use of valuation methods in a policy context; history of non-market valuation methods; welfare change measures, survey techniques, contingent valuation, choice experiment, travel cost method and hedonic pricing. Assignments on survey design and the processing the data.

**Realisation and working methods:** Lectures 16, practical work 10, group work 14, independent study 40 hours

**Study materials and literature:** A Primer in Nonmarket Valuation. Edited by Champ, P. A., Boyle, K. J., and Brown, T. C. 2003. Kluwer Academic Publishers.

**Evaluation:** Essay (60%) and assignments (40%)

**Other information:** In connection with YE13.2

#### **Special Topics in Forest Economics and Policy (FEC260) 3-7 credits** 83047

**Timing:** To be announced.

**Responsible person:** Professor Jari Kuuluvainen

**Contents:** Current issues in forest economics and policy.

**Other information:** Readings and conferences based on an individual plan.

#### **Literature (FEC270) 5 credits** 83044

**Responsible person:** Professor Jari

Kuuluvainen

**Objective:** To familiarise the student with the theories and practices of forest economics in conjunction with forest and environmental policy.

**Contents:** Literature exam. Literature for the final exam must be agreed upon with Professor Kuuluvainen.

**Realisation and working methods:** Independent study 80 hours.

**Study materials and literature:** The exam is based either on materials for environmental and resource economics:

- Baumol, W. J. and Oates, W. E. 1988. The theory of environmental policy. Cambridge University Press; The Dorsey Press, pp. 319-371.
- Bromley, D. W. 1991. Environment and Economy. Property Rights and Public Policy.
- Lesser, J. A., Dodds, D. E. and Zerbe Jr, R. O. 1997. Environmental Economics and Policy. Addison-Wesley, Oxford Blackwell.
- or on materials for forest policy:
- Cabbage, F. W., O'Laughlin, J. and Bullock III, C. S. 1993. Forest Resource Policy. John Wiley & Sons, Inc. Chapters 1-11 and 17.
- Verdung, E. 1997. Public Policy and Program Evaluation. Transaction Publishers.
- Ollonqvist, P. 1998. Metsäpolitiikka ja sen tekijät: pitkä linja 1928-1997.
- Wilson, B., Van Gooten, G. C., Vertinsky, I. and Arthur, L. (eds.). 1999. Forest Policy. International Case Studies. CABI Publishing.

**Evaluation:** Exam.

**Private Forestry and Forest Policy (FEC271) 3 credits**

83039

**Timing:** Spring term, period III.

**Responsible person:** Professor Heimo Karppinen

**Objective:** Familiarisation with the characteristics of private forestry and related forest policy in Finland. In addition, a survey of private forestry in other industrialised countries is provided.

**Contents:** A profile of private forest owner in Finland, private forestry in industrialised countries (group work), social sustainability in private forestry, forest management behavior, timber supply behavior, forest policy measures.

**Realisation and working methods:** Lectures 18, group work 18, independent study 45 hours

**Study materials and literature:** Provided in

the lectures

**Evaluation:** Exam (80%) and group work (20%)

**Other information:** Students are asked to sign up at WebOodi.

**Essays (FEC280) 3 credits**

83045

**Responsible person:** Professor Jari Kuuluvainen

**Objective:** Training in the use of professional language and expression.

**Contents:** The student prepares two essays, one of which is a research report based on the Master's Thesis. Topics and the language in which the essays are written must be agreed upon with Professor Kuuluvainen.

**Realisation and working methods:** Independent study 80 hours

**Master's Thesis (FEC290) 40 credits**

83046

**Responsible person:** Professor Jari Kuuluvainen

**Objective:** To learn how to plan, conduct and report on an independent research project.

**Realisation and working methods:** Independent study 1068 hours

## Courses in Finnish

**Introduction to studies in forest science (MMEKN100) 2 credits**

837007

**Timing:** Autumn term, period I.

**Contents:** A general introductory course for all forestry students. The course gives a general overview of the forestry curricula and essential topics in forestry. The students are introduced to the forestry departments, teachers and staff, and study practises and options. The planning of the student's personal study plan for completing the Bachelor's degree is related closely to this course.

**Personal Study Plan (B.Sc.) (MMEKN101) 2 credits**

837008

**Timing:** At the beginning of studies toward the Bachelor's degree

**Contents:** Study and career planning.

**Career planning (MMEKN110) 1 credit**

837004

**Timing:** Spring term, IV period.

**Contents:** Planning for a career and applying for a job in the Finnish forest sector.

**Ethics and Social Responsibility in the Forest Sector (MMEKN120) 3 credits**

837002

**Contents:** Basics of ethical decision-making.

**Introduction to forest economics (FEC110) 8 credits**

837011

**Timing:** Spring term.

**Contents:** The goals of forest resource management; commensurability of revenues and costs incurred at different times; economics of forest management and optimal rotation age; timber supply and demand; forest industry product supply, input demand; non-market benefits of forests and theoretical basics of forest policy.

**Fundamentals of forest economics (FEC120) 10 credits**

837012

**Timing:** Autumn term.

**Contents:** Economic theory of investment calculations and optimal forest management methods; profit calculation, profitability and forest valuation; forest policy and its implications for decision-making; timber demand and supply analysis; functioning of forestry products market and introduction to cost-benefit analysis.

**Research Seminar (B.Sc.) (FEC180) 3 credits**

837013

**Timing:** Beginning session: Autumn term, period I.

**Contents:** The course consists of communication assignments (1 credit) and a written seminar (2 credits). This seminar and Business and Economic Finnish (FPM16) are closely related to each other and should be taken concurrently. Subjects of the seminar presentations must be agreed upon with Professor Kuuluvainen or Professor Valsta.

**Bachelor's Thesis (FEC190) 6 credits**

837014

**Timing:** 3rd year.

**Contents:** The student deepens his/her

knowledge of the subject chosen in the course FEC180 and writes a B.Sc. thesis.

**Business Strategy and Management Simulations (FECM230) 5 credits**

83718

**Timing:** Spring term.

**Contents:** The course begins with a literature exam. Before the actual simulation sessions begin, student groups establish a company according to the data given. Companies compete against one another during the simulation sessions in the computer classroom. The attendance of all team members is necessary in all sessions. To complete the course requirements, each team must submit a written initial and final report about their particular case. Unless otherwise indicated, the course is given in Finnish only.

## Forest Products Marketing

The main educational objective of this major is to generate knowledge and skills supporting especially the international marketing of forest industry products. Marketing of roundwood and forestry services are also included in Forest Products Marketing. The major covers the whole chain, starting from the forest and ending with the marketing of forestry sector end products.

As an applied science, Forest Products Marketing is defined by the area it is applied to. The scientific objective of this major is to describe, explain and forecast phenomena in its area of interest and thus influence the decision-making in the forest sector. To reach this objective, Forest Products Marketing relies heavily on its mother sciences, of which the most important are the behavioural sciences, economics and the methodological sciences.

The general principle is that B.Sc.-level studies are taught in Finnish, while M.Sc.-level studies are taught in English. However, students wishing to engage in FPM studies should first contact the FPM professor to agree upon a tailored study plan. Also, the pre-requisite courses should be taken into account in making such a study plan.

### Teaching staff

Professor Heikki Juslin  
Professor Mikko Tervo  
University Lecturer Sami Berghäll  
Assistant Tomi Amberla

### REQUIREMENTS FOR THE BACHELOR'S DEGREE, 180 CREDITS

#### GENERAL STUDIES

MMEKN100	Introduction to Studies in Forest Science, 2 cr
ME101	Basics of Forest Ecology and Silviculture, 3 cr
MARV1	Basics of Forest Mensuration and Management, 9 cr
METEK11	Basic Forest Technology, 3 cr
PTEK20	Bases of Wood Technology, 3 cr
METEK12	Basic Training in Forest and Wood Technology, 3 cr

Y60	Commercial Law, 4 cr
MMEKN110	Career Planning, 1 cr
Y130	Basics of Statistical Inference, 5 cr
Y125	Basic Course in Research, 2 cr
FPM63	Personal Study Plan (B.Sc.), 2 cr

#### MAJOR STUDIES

##### Basic studies

Y55	Basic Course in Economics, 10 cr
Y105	Basic Course in Marketing, 5 cr
Y145	Basics of Accounting, 4 cr
FPM1	Basic Course in Forest Products Marketing, 3 cr
MMEKN120	Ethics and Social Responsibility in the Forest Sector, 3 cr

##### Intermediate studies

EE047	Organizational Behaviour, 5 cr
Y75	Managerial Accounting, 5 cr
FEC110	Introduction to Forest Economics, 8 cr
FPM7	Structures and Functions of Forest Products Marketing, 9 cr
FPM17	FPM Seminar, 5 cr
FPM10-15	Two Business language courses, 14 cr
FPM21a	Commercial Training, 3 cr
FPM8	End-Use and Users of Forest Industry Products, 9 cr
MMVAR25	Practical Training, 2 cr
FPM17b	Bachelor's Thesis, 6 cr
	Maturity Essay

#### LANGUAGE STUDIES AND STUDIES IN INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)

	Second domestic language, 4 cr
	Two foreign languages, 6 cr
	ICT driving licence, 3 cr
	or FPM61A Information and Communication Technology of FPM (B.Sc.), 3 cr.
FPM16	Business and Economic Finnish, 5 cr

#### MINOR STUDIES

Basic studies in one subject, approval of the professor is required, 25 credits

#### FREE-CHOICE STUDIES, 9 CREDITS

## REQUIREMENTS FOR THE MASTER'S DEGREE, 120 CREDITS

### GENERAL STUDIES

Y126	Basic Course in Research 2, 2 cr
FPM61B	Information and Communication Technology of FPM (M.Sc.), 2 cr
FPM64	Personal Study Plan (M.Sc.), 1 cr

### MAJOR STUDIES

#### Advanced studies

FPM25	Strategic Planning of Forest Products Marketing, 5 cr
FPM26	Marketing Planning and Research (Survey Research), 6 cr
FPM27	Advanced Literature, 6 cr
FPM18	Master's Thesis Seminar, 5 cr
FPM19	Articles, 3 cr
FPM20	Master's Thesis, 40 cr
FPM21b	Maturity Essay
FPM21b	Special Practical Training, 12 weeks, 3 cr
FPM10-15	One business language course, 7 cr
FECM230	Business Strategy and Management Simulations, 5 cr

### OTHER STUDIES

Elective studies (approval of professor is required), 20 cr

### FREE-CHOICE STUDIES, 15 CREDITS

## Courses in English

### Teaching events in WebOodi

#### **Marketing of Roundwood and Forestry Services (FPM3) 5 credits**

84028

**Timing:** Spring term, period III. Recommended to be taken in the 1st year of Master's degree studies.

**Responsible person:** Professor Mikko Tervo

**Relations to other study units:** Recommended courses to be taken before FPM3: FPM7 and FPM8

**Objective:** Learning the basic principles of the marketing of services in forestry

**Contents:** Principles of services marketing, customer satisfaction research and customer relationships management are introduced in the context of forest sector. Theoretical concepts, survey measures, and analytical tools are applied to business transactions in the forestry

market. Lectures and independent reading are supported with exercises. Each student produces a portfolio of essays on marketing theory and elements for a customer satisfaction survey.

**Realisation and working methods:** Lectures 30, practical work 40, independent study 50 hours.

**Evaluation:** Portfolio of essays and exercises.

#### **Structures and Functions of Forest Products Marketing (FPM7) 9 credits**

84050

**Timing:** Spring term, period III. Recommended to be taken in the 2nd year of studies.

**Responsible person:** Professor Heikki Juslin

**Relations to other study units:** Prerequisites: FPM1 lectures

**Objective:** Understanding and application of FPM in theory and practice.

**Contents:** In connection with the comprehensive marketing planning, students are familiarised with forest products marketing channels and functions. The planning of marketing channels and functions is connected with marketing strategy. The study of this subject matter is based both on theoretical models and practical applications. Exercises are given.

**Realisation and working methods:** Lectures 30, group work 40, independent study 170 hours

**Evaluation:** Exam on lectures and exercise 30%, final exam 70%.

#### **FPM Seminar (FPM17) 5 credits**

84053

**Timing:** In 3rd year of studies.

**Responsible person:** Professor Heikki Juslin

**Relations to other study units:** Prerequisites: FPM7 lectures

**Objective:** Ability to write and present logical, systematic and crystal-clear (semi-)scientific papers. Ability to participate in professional discussion.

**Contents:** The student is trained to prepare a scientific paper and to present it orally. Every participant prepares a seminar paper for presentation and discussion. All participants take turns during the seminar serving as a discussion leader and an opponent. Students are also required to have the text of their presentation checked by the teacher of the FPM11 (see FPM11 - Writing in English).

**Realisation and working methods:** Lectures

40, independent study 93 hours

**Evaluation:** Presentations are evaluated on the contents of the papers and the way they are presented

**Other information:** Seminar paper forms the basis of the B.Sc. thesis.

**Personal Study Plan (M.Sc.) (FPM64) 1 credit**  
84064

**Timing:** In the 1st year of Master's degree studies.

**Responsible person:** Professor Heikki Juslin

**Objective:** Systematic overview of M.Sc. level studies.

**Contents:** Designing and discussing M.Sc. level studies.

**Realisation and working methods:** Lectures 3, independent study 24 hours

**Evaluation:** Pass/Fail, based on the plan and participation.

**Master's Thesis Seminar (FPM18) 5 credits**  
84055

**Timing:** In 1st year of Master's degree studies.

**Responsible person:** Professor Mikko Tervo and Professor Heikki Juslin

**Relations to other study units:** Prerequisites: FPM25

**Objective:** Planning a Master's thesis

**Contents:** The student becomes familiar with applying scientific methodology, research planning and principles of conducting research. Thereafter, students prepare a research plan for the Master's thesis and present it to the class for discussion and criticism.

**Realisation and working methods:** Lectures 30, independent study 103 hours

**Evaluation:** Exercises, research plan, and participation

**Master's Thesis (FPM20) 40 credits**  
84020

**Timing:** In the 2nd year of Master's degree studies.

**Responsible person:** Professor Heikki Juslin

**Objective:** To acquire skills needed in planning and implementation of a scientific research project.

**Contents:** Planning, implementing and reporting a scientific research project.

**Realisation and working methods:** Lectures 10, independent study 1058 hours

**Special Practical Training, 12 Weeks (FPM21B) 3 credits**

84031

**Timing:** In the 1st or the 2nd year of Master's degree studies.

**Responsible person:** Assistant Tomi Rinne

**Objective:** Gathering a comprehensive and in-depth understanding of marketing in forest industries or in other relevant business sectors.

**Contents:** Practical issues in marketing and market research in forest industries or in other relevant business sectors. Working in the field of forest products marketing or in other applicable special field. Special practical training has to be approved by the assistant of Forest Products Marketing in advance.

**Evaluation:** Training report according to the instructions. The instructions for preparing the report are available in Room 514. Pass/Fail.

**Other information:** The department is not responsible for providing the training positions.

**Strategic Planning of Forest Products Marketing (FPM25) 5 credits**

84051

**Timing:** II and III period. In the 1st year of Master's degree studies. Offered 2007-08.

**Responsible person:** Professor Heikki Juslin

**Relations to other study units:** Prerequisites: FPM7 lectures

**Objective:** Understanding of theory and application of the principles of strategic planning on corporate, business and marketing levels.

**Contents:** The course gives a deep knowledge of the strategic planning of forest products marketing and connects it with information retrieval. Planning of corporate strategy and marketing strategy is explained and discussed in the context of the related needs for marketing information. The students carry out a course exercise on a given topic and participate in the group sessions. This course is associated with the writing of the first article (only for students whose major is Forest Products Marketing, see FPM19).

**Realisation and working methods:** Lectures 30, group work 40, independent study 63 hours

**Study materials and literature:** Material is distributed in connection with the lectures.

**Evaluation:** Final exam. Approved exercises and participation in the group sessions.



**Marketing Planning and Research (Survey Research) (FPM26) 6 credits**

84052

**Timing:** Autumn term. In 1st year of Master's degree studies.

**Responsible person:** Alvar (Sami) Berghäll

**Relations to other study units:** Prerequisites: Y130, FPM8 and FPM25 lectures

**Objective:** The course aims to provide a comprehensive basic understanding of how modern quantitative marketing research and social research is conducted and how the results of this research are applied in solving Forest Products Marketing (FPM) research problems.

**Contents:** The course begins with a course exam on the literature. Enrolees who pass this examination will do group work in pairs, and practice in carrying out a survey research project using a learning-by-doing approach. The work starts with discussion and preparation of a theoretical frame of reference and a research plan on a given case based on real data as well as familiarisation with the statistical analysis program SPSS. After the lectures each group prepares a research report (a miniature Master's thesis) under the personal guidance of the instructor, who also provides the topic and the data. (Those already having a M.Sc. thesis topic can work with their topic and related data.) The reports should be completed by the beginning of December, but first drafts should be ready by the middle of November. The course ends in December with two seminar sessions. In these researcher colloquiums, each group presents the work it has done in the style of a researcher reporting her/his results to a scientific congress (attendance obligatory).

**Realisation and working methods:** Lectures 18, practical work 82, group work 40, independent study 20 hours

**Study materials and literature:** Juslin H and Lindström, T. The Planning and Implementation of Marketing Research. (Available at the office.)

**Evaluation:** Pass/fail based on the examination of literature, SPSS skills assessment and approved case report.

**Other information:** In connection with FECP220. This version of the course is for the FPM-majors. The course utilises WebCT as a virtual working environment.

**Advanced Literature (FPM27) 6 credits**

84054

**Responsible person:** Professor Heikki Juslin

**Relations to other study units:** Prerequisites: FPM25

**Objective:** Forming a comprehensive picture of marketing theory and science.

**Contents:** Exam on literature.

**Realisation and working methods:** Independent study 160 hours

**Evaluation:** Exam on literature.

**Information- and communication technology of FPM (M.Sc.) (FPM61B) 2 credits**

84065

**Responsible person:** Alvar (Sami) Berghäll

**Relations to other study units:** See below; FPM7, FPM17, FPM25 and FPM26

**Objective:** Strengthening student's ICT skills

**Contents:** ICT skills related to forest products marketing: SPSS test in connection with FPM26, WebCT exercise in connection with FPM26 and PowerPoint presentation in connection with FPM7, FPM17 and FPM25.

**Realisation and working methods:** Practical work 4, group work 24, independent study 25 hours

**Evaluation:** Pass/fail

**Post-Graduate Research Seminar (FPM30) 3 credits**

84025

**Responsible person:** Professor Heikki Juslin and Professor Mikko Tervo

**Objective:** Ability to conduct high quality academic research.

**Contents:** Researcher seminar is the primary discussion forum for FPM researchers. The core content arises out of current issues of FPM research involving theory construction, methodology and philosophy of science, preparation of research plans and reporting of research results. The seminar gives those attending an in-depth view on how FPM approaches the research problems in its field of research. Through networking, the seminar also increases possibilities for cooperation and exchange of ideas.

**Realisation and working methods:** Lectures 50, independent study 30 hours

Department of Forest Economics

### **Courses in Finnish**

**Information- and communication technology of FPM (B.Sc.) (FPM61A ) 3 credits**  
84061

**Personal Study Plan (B.Sc.) (FPM63) 2 credits**  
84063

**Basic Course in Forest Products Marketing (FPM1) 3 credits**  
84026

**End-Use and Users of Forest Industry Products (FPM8) 9 credits**  
84008

**Industrial Use of Forest Industry Products (FPM9) 5 credits**  
84009

**Business Swedish (FPM10) 7 credits**  
84010

**Business English (FPM11) 7 credits**  
84011

**Business German (FPM12) 7 credits**  
84012

**Business Spanish (FPM13) 7 credits**  
84013

**Business French (FPM14) 7 credits**  
84014

**Business Russian (FPM15) 7 credits**  
84015

**Business and Economic Finnish (FPM16) 5 credits**  
84060

**Bachelor's Thesis (FPM17B) 6 credits**  
84044

**Commercial Training (FPM21A) 3 credits**  
84030

**Special Course in Forest Products Marketing (FPM23) 2-3 credits**  
84023

**Personal Communication (FPM28) 3 credits**  
84021

**Articles (FPM19) 3 credits**  
84058

**Timing:** In 1st year of Master's degree studies.  
**Contents:** A total of four articles are written. The course aims at improving written in the context of forest products marketing. The first article is written during FPM25, the second during FPM10 (Swedish), the third during the third obligatory commercial language course (usually FPM12) and the fourth article during FPM20. In special cases the second and third article can be written in connection with FPM20. Articles are corrected by the teacher of the respective course. In addition, the first article is evaluated by a teacher of Finnish/Swedish language.

## DEPARTMENT OF FOREST RESOURCE MANAGEMENT

The Department of Forest Resource Management has one main subject: Forest Resource Science and Technology. This subject is divided into four specialisation lines: Forest Planning, Forest Inventory, Forest Technology and Wood Technology. The department also offers geoinformatics and logistics as common subjects.

Teaching at the department covers a wide range of technical and economical questions related to the management and monitoring of forest resources, wood procurement and wood as a raw material.

### Head of the Department

Professor Marketta Sipii

### Contact information

Department of Forest Resource Management  
P.O. Box 27  
FI-00014 University of Helsinki  
Finland  
tel. + 358-9-191 58174  
fax + 358-9-191 58159  
Internet: <http://mm.helsinki.fi/mmvar/english/>

### REQUIREMENTS FOR THE BACHELOR'S DEGREE, 180 CREDITS Applicable to all four specialisation lines

#### GENERAL STUDIES

MMVAR10 Introduction to Studies in Forest Sciences, 3 cr  
Y130 Basics of Statistical Inference, 5 cr  
Y96 Demonstration of Proficiency in High School Mathematics, 0 cr  
Y100 Mathematics I, 5 cr  
Y125 Basic Course in Research, 2 cr  
Y115 Operational Research, 3 cr  
KASV148 Identification of Forest Plants, 2 cr  
MMVAR16 Personal Study Plan (B.Sc.), 2 cr

Additional courses based on the selected specialisation line:

#### *Forest Planning and Forest Inventory*

Y131 Statistical Models 1, 5 cr  
Y132 Statistical Models 2, 3 cr  
GIS1 Desktop GIS, 2 cr

#### *Forest technology*

LOG1 Basics of Logistics, 3 cr  
YFYS1 Physics I, 5 cr  
Y75 Managerial Accounting, 5 cr  
GIS1 Desktop GIS, 2 cr

#### *Wood technology*

GIS1 Desktop GIS, 2 cr  
LOG1 Basics of Logistics, 3 cr  
YFYS1 Physics I, 5 cr

Instead of LOG1 and YFYS1, students may choose YKEM100 Chemistry, Lectures, 8 cr

### MAJOR STUDIES

#### Basic studies

MARV1 Basics of Forest Mensuration and Management, 9 cr  
MARV2 Forest Management Planning, 4 cr  
METEK11 Basic Forest Technology, 3 cr  
METEK12 Basic Training in Forest and Wood Technology, 3 cr  
PTEK20 Bases of Wood Technology, 3 cr

One course from the following:

GIS3 Remote Sensing 1, 3 cr  
MMVAR21 Essays, 3 cr  
METEK16 The Environmental Effects of Wood Utilization, Wood Procurement and Silvicultural Practices, 3 cr

#### Intermediate studies

MARV3 Field Training Course in Forest Management Planning, 5 cr  
METEK14 Methods of Logging and Wood Transport, 6 cr  
GIS4 Principles of GIS, 4 cr  
PTEK15 Wood Product Industry, 5 cr  
or PTEK36 Production of Pulp and Paper, 5 cr  
MMVAR21 Essays, 3 cr  
MMVAR22 Bachelor's Literature, 3 cr  
MMVAR23 Bachelor's Thesis, 6 cr  
Maturity Essay

Department of Forest Resource Management

MMVAR24 Bachelor's Seminar, 3 cr  
MMVAR25 Practical Training, 2-3 cr

Additional courses based on the selected specialisation line:

*Forest Planning and Forest Inventory*

MARV4/1 Forest Inventory, 4 cr  
MARV4/2 Inventory Project, 5 cr  
MARV5/1 Multi-Attribute Forest Planning, 6 cr  
MARV5/2 Decision Support System, 3 cr  
GIS3 Remote Sensing 1, 3 cr  
GIS12 Remote Sensing 2, 5 cr

*Forest technology*

METEK16 The Environmental Effects of Wood Utilization, Wood Procurement and Silvicultural Practices, 3 cr  
METEK22 Mechanized Harvesting and Forest Machine Engineering, 5 cr  
METEK23 Excursion to Logging and Forest Industry, 2 cr  
METEK24 International Wood Procurement, 3 cr  
METEK25 Forest Work Studies, 3 cr  
METEK39 Terra Mechanics, 5 cr  
PTEK35 Scaling of Wood Raw Materials, 3 cr

*Wood technology*

PTEK12 Forest Industrial Laboratory Work, 3 cr  
PTEK15 Wood Product Industry, 5 cr  
PTEK21 Wood Science, 3 cr  
PTEK34 Wood as Construction and Furniture Material, 5 cr  
PTEK35 Scaling of Wood Raw Materials, 3 cr  
PTEK36 Production of Pulp and Paper, 5 cr  
PTEK37 Wood as Fibre Material, 5 cr  
PTEK41 Current Topics in Wood Technology, 3 cr  
METEK23 Excursion to Logging and Forest Industry, 2 cr

**LANGUAGE STUDIES AND STUDIES IN INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)**

Second domestic language, 4 cr  
Foreign language, 3 cr  
ICT driving licence, 3 cr  
MMVAR11 Excel exercises in Forest Mensuration and Management, 2 cr

**OTHER STUDIES**

ME101 Basics of Forest Ecology and Silviculture, 3 cr  
ME102 Finnish Forest Soil Properties and Processes and the Forest Site Type Classification, 5 cr  
ME104 Silviculture, 5 cr  
FEC110 Introduction to Forest Economics, 8 cr  
FPM1 Basic Course in Forest Product Marketing, 3 cr

**MINOR STUDIES**

Basic studies in one subject, approval of the professor is required, 25 credits

**FREE-CHOICE STUDIES, 0-14 CREDITS**

**Courses in English**

**Teaching events in WebOodi**

**Essays (MMVAR21) 3 credits**

87421

**Timing:** Master's studies, 1st-2nd year. Detailed timetable will be agreed separately with the professor.

**Responsible person:** Prof. Annika Kangas (MSUU), Prof. (acting) Markus Holopainen (MINV), Prof. Esko Mikkonen (METEK), Prof. Marketta Sipi (PTEK)

**Objective:** To practise skills in writing and in making oral presentations

**Contents:** Writing of reports and creation of PowerPoint or corresponding presentations

**Realisation and working methods:** Independent study 80h

**Study materials and literature:** Agreed with the professor

**Evaluation:** Topics and contents approved in advance by the professor. Evaluation of spelling of one essay by an English teacher of the university.

**Project planning and management (MMVAR31) 5 credits**

87431

**Timing:** Spring term, period III

**Responsible person:** Prof. Esko Mikkonen

**Relations to other study units:** Prerequisite: B.Sc. level

**Objective:** Understanding the project as a tool; project planning and management; tools for project work.

**Contents:** The project as a management tool; project planning and scheduling; data collection and management.

**Realisation and working methods:** Lectures 16 h, Practical work 4 h, Group work 40 h, Independent study 20 h

**Study materials and literature:** Given in lectures.

**Evaluation:** Approved report

**Research Workshop (MMVAR32) 5 credits**  
87432

**Timing:** I - IV periods

**Responsible person:** Lecturer Hannu Rita, University Lecturer Juha Rikala, teachers in other specialisation lines of the department.

**Objective:** To increase the student's ability to evaluate articles from different points of view in order to support the preparation of the Master's thesis.

**Contents:** Evaluation of scientific articles: theoretical background, hypotheses, objectives, statistical methods, results, discussions

**Realisation and working methods:** Lectures 16 h, Group work 60 h, Independent study 60 h

**Study materials and literature:** Handed out in lectures

**Evaluation:** Active participation in meetings and presentations

**Other information:** A detailed schedule will be given later.

**Master's thesis (MMVAR33) 40 credits**  
87433

**Timing:** Master's studies 1st-2nd year

**Responsible person:** Prof. Annika Kangas (MARV), Prof. (acting) Markus Holopainen (MINV), Prof. Esko Mikkonen (METEK), Prof. Marketta Sipi (PTEK)

**Objective:** To practise as a student in scientific research work and reporting of results in his/her specific research field

**Contents:** Collecting, processing and analysing data

**Realisation and working methods:** Independent study 1080 h

**Evaluation:** Accepted thesis

**Special practical training (MMVAR35) 3 credits**  
87435

**Timing:** Master's studies 1st-2nd year (or outside academic years)

**Responsible person:** Prof. Annika Kangas

(MSUU/MINV), MMM Kalle Ylisirniö (METEK), University Lecturer Juha Rikala (PTEK)

**Objective:** To familiarize the student with scientific research work in a research institute, university, or forest industry.

**Contents:** Working in a study project, writing of training report

**Realisation and working methods:** Independent study 80 h

**Evaluation:** Approved training report with the working reference. Instructions from the department.

**Other information:** Advance approval of the training is required.

**Personal Study Plan (M.Sc.) (MMVAR36)**  
1 credit

87436

**Timing:** At the beginning of advanced studies

**Responsible person:** Prof. Annika Kangas (MSUU), Prof. (acting) Markus Holopainen (MINV), University Lecturer Juha Rikala (PTEK), M.Sc. Kalle Ylisirniö (METEK)

**Contents:** Personal study plan of advanced studies

**Evaluation:** Accepted personal study plan

**Basic Course in Programming (MMVAR37)**  
3 credits

87437

**Timing:** Period III

**Responsible person:** M.Sc. Jussi Rasinmäki, M.Sc. Antti Mäkinen

**Objective:** To give students basic abilities to solve data processing problems computationally.

**Contents:** The students will first learn the basics of programming and then apply those skills to solve problems commonly met when dealing with research material. Python programming language will be used during the course.

**Realisation and working methods:** Lectures 10 h, Practical work 40 h, Independent study 30 h

**Study materials and literature:** The course material will be available on the web pages of the course.

**Evaluation:** Based on the course exercises.

**Other information:** Details of the course will be available later.

**It is possible to pass following courses also in English (see description under courses in Finnish):**

**Personal study plan (B.Sc.) (MMVAR16) 2 credits**

**Literature (B.Sc.) (MMVAR22) 3 credits**

**Bachelor's Thesis (MMVAR23) 6 credits**

**Bachelor's Seminar (MMVAR24) 3 credits**

**Practical Training (MMVAR25) 2-3 credits**

**Master's Seminar (MMVAR34) 3 credits**

**Licentiate Literature (MMVAR42) 5 credits**

**Licentiate Seminar (MMVAR44) 3 credits**

## Courses in Finnish

**Introduction to studies in forest sciences (MMVAR10) 3 credits**

87410

**Timing:** Autumn term, period I

**Contents:** This is a general introductory course for forestry students. The course gives a general overview of the forestry curricula and the essential questions of forestry. The course introduces forestry departments, teachers and studying practises. Each participant prepares a personal study plan.

**Excel Exercises in Forest Mensuration and Management (MMVAR11) 2 credits**

87411

**Timing:** period IV

**Contents:** The Excel exercises integrated into the MARV1 course.

**Personal Study Plan (B.Sc.) (MMVAR16) 2 credits**

87416

**Timing:** First and second autumn

**Contents:** Preparation of a personal study plan for the Bachelor's degree

**Literature (B.Sc.) (MMVAR22) 3 credits**

87422

**Timing:** 3rd academic year.

**Contents:** Study on readings for Bachelor's thesis

**Bachelor's thesis (MMVAR23) 6 credits**

87423

**Timing:** 3rd academic year

**Contents:** Brief research report based on primary or secondary data

**Bachelor's seminar (MMVAR24) 3 credits**

87424

**Timing:** Periods II-IV.

**Contents:** Academic writing, fluent writing and speaking, acting as an opponent, evaluation of papers and critical thinking

**Practical training (MMVAR25) 2-3 credits**

87425

**Timing:** 2nd or 3rd academic year (or outside academic years)

**Contents:** Practical training

**Master's Seminar (MMVAR34) 3 credits**

87434

**Contents:** Theoretical background of the research, selection of scientific methods.

**Licentiate and Doctoral Literature (MMVAR42) 10 credits**

87442

**Timing:** Whole academic year

**Contents:** Literature

**Licentiate and Doctoral Seminar (MMVAR44) 3 credits**

87444

**Timing:** to be arranged individually

**Contents:** Theoretical backgrounds of study, selection of scientific methods.

## Wood Technology

Wood Technology is an applied science that focuses on wood structure and properties and their effect on industrial processes and products. Instruction is provided in a combination of lecture courses, excursions to forest industry facilities, laboratory training, seminars and literature. Wood Technology is a suitable major for those who intend to specialise in management, expert and export duties or various tasks in research and teaching.

### Teaching staff

Professor Marketta Sipi  
University Lecturer Juha Rikala  
Professor Jouni Paltakari, Helsinki University of Technology  
Senior Researcher Pekka Saranpää, Finnish Forest Research Institute  
Senior Scientist Jari Sirviö, KCL

### Contact information

Department of Forest Resource Management  
P.O. Box 27  
FI-00014 University of Helsinki  
Finland  
tel. +358 9 191 58174  
fax +358 9 191 58159

## REQUIREMENTS FOR THE MASTER'S DEGREE, 120 CREDITS

### GENERAL STUDIES

Y136 Statistical Data Processing, 4 cr  
Y126 Basic Course in Research 2, 2 cr  
MMVAR36 Personal Study Plan, 1 cr  
At least 9 credits from the following:  
Basics of database, 4 cr  
Y131 Statistical Models 1, 5 cr  
YFYS2 - FYS5 Studies of physics, 5 cr  
Language studies 5-10 credits

### MAJOR STUDIES

#### Advanced studies

MMVAR31 Project planning and management, 3 cr  
MMVAR32 Research Workshop, 5 cr  
MMVAR33 Master's Thesis, 40 cr  
Maturity Essay  
MMVAR34 Master's Seminar, 3 cr  
MMVAR35 Special Practical Training, 3 cr  
PTEK7 Literature in Wood Technology, 6 cr  
Additional recommendations:  
FECM220 Economics of the Timber Industry, 5 cr  
FECM230 Business Strategy and Management Simulations, 6 cr

### FREE-CHOICE STUDIES, 31 CREDITS

## Courses in English

### Teaching events in WebOodi

#### Current Topics in Wood Technology (PTEK41) 3 credits

83994

**Timing:** Spring term, period III.

**Responsible person:** University Lecturer Juha Rikala, visiting lecturers

**Objective:** To deepen a student's knowledge in the topical questions of wood technology

**Contents:** Expert presentations, writing a report of a topical question of wood technology

**Realisation and working methods:** Lectures 10 h, Practical work 2 h, Independent study 68 h

**Study materials and literature:** Material given in lectures

**Evaluation:** Participation in lectures and an acceptable report on a given topic

**Other information:** Detailed schedule will be given later.

#### Literature Examination (M.Sc.) in Wood Technology (PTEK7) 6 credits

83907

**Timing:** periods I-IV

**Responsible person:** Prof. Marketta Sipi

**Relations to other study units:** MMVAR34

**Objective:** To deepen a student's knowledge of a topic in wood technology

**Contents:** Advanced readings in wood technology

**Realisation and working methods:** Independent study 160 h

**Study materials and literature:** Agreed separately with the professor

**Evaluation:** Essays on topics provided by the professor and/or literature exam

## Courses in Finnish

#### Forest Industrial Laboratory Work (PTEK12) 3 credits

83912

**Timing:** Spring term, period IV.

**Contents:** Making of laboratory sheets, measuring of paper properties, laboratory report, literature review

#### Wood Product Industry (PTEK15) 5 credits

83915

**Timing:** Autumn term, period II.

Department of Forest Resource Management

**Contents:** Raw materials of wood product industry, processes, products and their properties

**Bases of Wood Technology (PTEK20) 3 credits**  
83925

**Timing:** Autumn term, period I.

**Contents:** Finnish forest industry and its products, wood structure and properties, role of wood properties in processing

**Wood Science (PTEK21) 3 credits**  
83926

**Timing:** Autumn term, period I.

**Contents:** Wood structure, differences between species, microscopic and macroscopic identification

**Wood as a Construction and Furniture Material (PTEK34) 5 credits**  
83934

**Timing:** Spring term, periods III and IV.

**Contents:** Effect of wood properties on the furniture and construction industry; chemical and structural protection and modifying of wood

**Scaling of Wood Raw Materials (PTEK35) 3 credits**  
83935

**Timing:** Spring term, period III.

**Contents:** Description and measurement of quality and quantity of wood. Theoretical foundations, methodology, organizations, regulations, and methods. The course includes exercises.

**Production of Pulp and Paper (PTEK36) 5 credits**  
83936

**Timing:** Autumn term, periods I and II.

**Contents:** Production of wood pulp and its raw materials. Introduction to pulp properties; processes variables; paper manufacturing; paper structure and properties

**Wood as Fiber Material (PTEK37) 5 credits**  
83902

**Timing:** Spring term, periods III and IV.

**Contents:** Variation in fibre properties and their measurement in pulp. Exploration of the causal relations between fibre properties and paper properties.

## Forest Technology

Forest Technology deals with wood harvesting and transport, forest work science and planning of wood procurement. Machinery for wood procurement and forest regeneration purposes is also included. Teaching consists of lectures and field courses, excursions, practical exercises, seminars and literature surveys. As a specialisation line, Forest Technology suits students who are willing to study various aspects of wood procurement either in forestry, forest industry, research or teaching. The courses give a good background for international assignments dealing with cut-to-length technology and environmentally sound harvesting practices applying information technology.

### Teaching staff

Professor Esko Mikkonen  
Professor Marketta Sipä  
Kalle Ylisirniö

### Contact information

Department of Forest Resource Management  
P.O. Box 27  
FI-00014 University of Helsinki  
Finland  
Tel. +358 9 191 58192  
Fax +358 9 191 58159  
<http://www.mm.helsinki.fi/mmvar/english/>

## REQUIREMENTS FOR THE MASTER'S DEGREE, 120 CREDITS

### GENERAL STUDIES

Y136 Statistical Data Processing, 4 cr  
Y126 Basic course in Research 2, 2 cr  
Basics of database, 5 cr  
Y131 Statistical Models 1, 5 cr  
MMVAR36 Personal Study Plan, 1 cr

### MAJOR STUDIES

#### Advanced studies

MMVAR31 Project Planning and Management, 3 cr  
MMVAR32 Research Workshop, 5 cr  
MMVAR33 Master's Thesis, 40 cr  
Maturity Essay  
MMVAR34 Master's Seminar, 3 cr  
MMVAR35 Special Practical Training, 3 cr



- METEK36 Operations Research in Wood Procurement, 8 cr  
METEK38 Literature of Forest Technology, 8 cr  
METEK40 International Field Trip, 1 cr  
METEK41 Current Topics in Forest Technology, 2 cr  
FEKM220 Economics of the Timber Industry, 5 cr

#### FREE-CHOICE STUDIES, 23 CREDITS

#### Courses in English

##### Teaching events in WebOodi

##### The Environmental Effects of Wood Utilization, Wood Procurement and Silvicultural Practices (METEK16) 3 credits 83838

**Timing:** Spring term, period IV

**Responsible person:** Professor Esko Mikkonen

**Objective:** To give students an overall picture of modern forest technology operations and their harmful impacts on the environment.

**Contents:** The course will use the PBL-approach to determine how to prevent or ameliorate harmful impacts on the environment.

**Realisation and working methods:** Lectures 14 h, Practical work 40 h, Independent study 26 h

**Evaluation:** Examination

**Other information:** Lectures are held in English if needed.

##### International Wood Procurement (METEK24) 3 credits 83804

**Timing:** Spring term 2008, weeks 13-14

**Responsible person:** Professor Esko Mikkonen

**Relations to other study units:** METEK21

**Objective:** To familiarize students with wood procurement in Finland and other countries.

**Contents:** Current issues of wood procurement in Finland and other countries. Arranged together with Estonian Agriculture University.

**Realisation and working methods:** Lectures, exercises and independent study

**Study materials and literature:** Distributed in the course

**Evaluation:** Examination, active participation to excursions

##### Operations Research in Wood Procurement (METEK36) 8 credits 83826

**Timing:** Intensive periods of instruction in spring or autumn

**Responsible person:** Professor Esko Mikkonen M.Sc. Kalle Ylisimä

**Relations to other study units:** Y100/Y101, Y115, METEK23, LME4, Elementary Operations Research classes, intermediate level studies in forest technology.

**Objective:** To give a student a broad overview of operations research methods and their applicability in wood procurement.

**Contents:** Operations research modelling

**Realisation and working methods:** Lectures 56 h, Independent study 160 h

**Study materials and literature:** Given pages from:

- Dykstra, D.P. 1984. Mathematical Programming for Natural Resource Management. New York.
- Lokki, O. Matemaattinen ohjelmointi I-II. OtaData. Espoo.
- Mikkonen, E. 1983. Eräiden matemaattisen ohjelmoinnin menetelmien käyttö puun korjuun ja kuljetuksen sekä tehdaskäsittelyn menetelmävalinnan apuvälineenä. Acta For. Fenn. 183.
- Taylor, B.W. 1990. Introduction of Management Science. Allyn and Bacon, Shimon & Shuster.
- Sikanen, L. Oinas, S. ja Harstela, P. (toim.) 1998. Operaatioanalyysimenetelmät ja puunhankinnan sovellukset. Joensuun yliopisto, metsätieteellinen tiedekunta. Tiedonantoja No. 83. QSB+. 1991. OR-sovellutusohjelmisto.
- Material and handouts given in the class.

**Evaluation:** 50% exam, 50% exercises

**Other information:** Lectures are held in English if needed.

##### Literature Examination (M.Sc.) in Forest Technology (METEK38) 6 credits 83812

**Timing:** Whole year

**Responsible person:** Professor Esko Mikkonen

**Relations to other study units:** Intermediate level courses.

**Objective:** To give the student a more detailed understanding of the methods and technologies applied in forest technology.

**Contents:** Set readings  
**Realisation and working methods:**  
Independent study 200 h  
**Evaluation:** Examination

**International Field Trip (METEK40) 2 credits**  
83830

**Timing:** Spring term, depending on the number of participants. Offered in even-numbered years.

**Objective:** Introduction to foreign land forest sectors

**Contents:** Scheduled travelling

**Study materials and literature:** Distributed during the course

**Current topics in forest technology (METEK41) 3 credits**  
83832

**Timing:** Spring term, depending on the number of participants

**Responsible person:** N.N.

**Objective:** An introduction to current topics

**Contents:** Lectures and presentations on current topics.

**Study materials and literature:** Distributed during course

## Courses in Finnish

**Methods of Logging and Wood Transport (METEK14) 6 credits**

83827

**Timing:** Periods II and III

**Contents:** Students are familiarised with harvesting machinery, harvesting methods and wood procurement resource allocation. Includes exercises. Harvesting and transportation of wood from the forest industry's point of view; supply chain management. Exercises in transportation and cut-to-length price matrices.

**Basic Forest Technology (METEK11) 3 credits**

83822

**Timing:** Spring term, period IV

**Contents:** General overview of purchasing, harvesting and transporting timber. Forest machinery and data systems. Economic and administrative impact of forest technology.

**Basic Training in Forest and Wood Technology (METEK12) 3 credits**

83829

**Timing:** Summer

**Contents:** Harvesting, thinning, sawing, productivity, tree fibre characteristics, wood measuring, logging quality control

**Mechanized harvesting and forest machine engineering (METEK22) 5 credits**

83815

**Timing:** Spring term 2007

**Contents:** Mechanical engineering, modelling wood transportation, visiting lectures from forest industry, trade unions and Finnish Forest and Park Service

**Excursion to Logging and Forest Industry (METEK23) 2 credits**

83816

**Timing:** Spring term, period III. Offered in even-numbered years.

**Contents:** Visits to pulp and paper mills, saws, logging sites

**Forest Work Studies (METEK25) 3 credits**

83828

**Timing:** autumn term, period II

**Contents:** Theory of work science, data collection and analysis. Exercises.

**Terra mechanics (METEK39) 5 credits**

83807

**Timing:** Spring term, periods III and IV. Offered in even-numbered years.

## Forest Planning

Forest Planning is an applied science that gives knowledge and skills in forest management planning. The aim of this subject is to enhance optimal use of forest resources, taking into account economic, ecological and other possible objectives of decision makers. Forest planning is an applied science that relies on decision science, forest economics and biological sciences applied to the forest. The teaching is based on lectures with exercises, comprehensive field courses, problem-based learning, literature and seminars.

### Teaching staff

Professor Annika Kangas

### Contact information

Department of Forest Resource Management  
P.O. Box 27  
FI-00014 University of Helsinki, Finland  
Tel. +358 9 191 58174  
<http://mm.helsinki.fi/mmvar/english/>

## REQUIREMENTS FOR THE MASTER'S DEGREE, 120 CREDITS

### GENERAL STUDIES

Y136 Statistical Data Processing, 4 cr  
Y126 Basic Course in Research 2, 2 cr  
Basics of database, 4 cr  
MMVAR37 Basic Course in Programming, 3 cr  
MMVAR36 Personal Study Plan, 1 cr

### MAJOR STUDIES

#### Advanced studies

MMVAR31 Project Planning and Management, 3 cr  
MMVAR32 Research Workshop, 5 cr  
MMVAR33 Master's Thesis, 40 cr  
Maturity Essay  
MMVAR34 Master's Seminar, 3 cr  
MMVAR35 Special Practical Training, 3 cr  
MSUU11 Literature Exam (M.Sc. in forest planning), 6 cr

At least two courses from the following:

MSUU12 Simulation of Forest Development, 4 cr  
MSUU13 Forest Biometrics, 4 cr  
MSUU14 Operations Research in Forest Planning, 4 cr

### FREE-CHOICE STUDIES, 33 CREDITS

### Courses in English

#### Teaching events in WebOodi

#### Literature Examination (M.Sc.) in Forest Planning (MSUU11) 6 credits

83423

**Timing:** Preferably in the fifth spring

**Responsible person:** Professor Annika Kangas

**Objective:** To deepen the knowledge of one's own subject area.

**Contents:** Literature

**Realisation and working methods:** Independent study 160 h

**Study materials and literature:** Examination of three of these books

1. Assman, E. 1970. The principles of forest yield study. Pergamon press. Pages 39-245, 287-330.
2. Pukkala, T. (Ed.). 2002. Multi-objective forest planning. Managing Forest Ecosystems Vol 5. Kluwer Academic Publishers. Dordrecht. 207 s.
3. Schmoltdt, D., Kangas, J., Mendoza, G.A. and Pesonen, M. (Eds.). 2001. The Analytic Hierarchy Process in Natural Resource and Environmental Decision Making. Kluwer Academic Publishers, Managing Forest Ecosystems 3. 305 pp.
4. Vancly, J. 1994. Modelling forest growth and yield: applications to mixed tropical forests. CAB International, Oxford.
5. von Gadow, K. 2001 (Ed.) . Risk analysis in forest management. Kluwer Academic Publishers, Managing Forest Ecosystems 2. 241 pp.
6. Malczewski, J. 1999. GIS and Multicriteria decision analysis. Wiley. 392 pp.

**Evaluation:** Examination.

#### Operations Research in Forest Planning (MSUU14) 4 credits

83447

**Timing:** Autumn term, II period. Offered in odd-numbered years.

**Responsible person:** Professor Annika Kangas, Ph.D. Jyrki Koivuniemi

**Relations to other study units:** Y115, MARV5/1

**Objective:** To be able to model and solve forest planning problems with LP and heuristic optimization.

**Contents:** Linear optimization, heuristic optimization, optimization packages

**Realisation and working methods:** Lectures 18 h, Practical work 18 h, Independent study 80 h

**Evaluation:** Examination and report

## Courses in Finnish

### Simulation of Forest Development (MSUU12) 4 credits

83412

**Timing:** Autumn term, II period. Offered in odd-numbered years.

**Contents:** Factors affecting growth, growth modelling, predicting stand growth

### Forest Biometrics (MSUU13) 4 credits

83413

**Timing:** Autumn term, period II. Offered in even-numbered years.

**Contents:** Statistical modelling, regression analysis, variance component models, mixed models, non-parametric models

## Forest Inventory

Forest Inventory is an applied science that helps the student to gain knowledge and skills in measuring the qualitative and quantitative characteristics of a tree, a forest stand and any larger forest area.

Students majoring in this field learn to apply remote sensing, statistical sampling techniques and GIS in forest inventory and monitoring. The teaching is based on lectures with exercises, comprehensive field courses, problem-based learning, literature and seminars.

### Teaching staff

Professor Markus Holopainen  
Lecturer Hannu Rita

### Contact information

Department of Forest Resource Management  
P.O. Box 27  
FI-00014 University of Helsinki  
Finland  
Tel. +358 9 191 58174  
<http://mm.helsinki.fi/mmvar/english/>

## REQUIREMENTS FOR THE MASTER'S DEGREE, 120 CREDITS

### GENERAL STUDIES

Y136 Statistical Data Processing, 4 cr  
Y126 Basic Course in Research 2, 2 cr  
Basics of database, 4 cr  
MMVAR37 Basic Course in Programming, 3cr  
MMVAR36 Personal Study Plan, 1 cr

### MAJOR STUDIES

#### Advanced studies

MMVAR31 Project Planning and Management, 3 cr  
MMVAR32 Research Workshop, 5 cr  
MMVAR33 Master's Thesis, 40 cr  
Maturity Essay  
MMVAR34 Master's Seminar, 3 cr  
MMVAR35 Special Practical Training, 3 cr  
MINV11 Literature Exam (M.Sc.) in Forest Inventory, 6 cr  
MINV12 Advanced Studies of Remote Sensing, 5 cr

At least one course from the following:

MSUU13 Forest Biometrics, 4 cr  
GIS15 Application Development and Applied WebGIS, 5 cr

Additional recommendations:

GIS10 Geostatistics and Geomodeling, 4 cr  
GIS11 Applied GIS Analysis, 5 cr

### FREE-CHOICE STUDIES, 33 CREDITS

## Courses in English

### Teaching events in WebOodi

### Literature Examination (M.Sc.) in Forest Inventory (MINV11) 6 credits 83422

**Timing:** Preferably in the fifth spring

**Responsible person:** Prof. (acting) Markus Holopainen

**Objective:** To deepen the knowledge of one's own subject area.

**Contents:** Literature

**Realisation and working methods:** Independent study 160 h

**Study materials and literature:** Two books about inventory methods / applications and one book about remote sensing / GIS systems:

#### **Inventory methods and applications**

1. Ringvall, A. 2000. Assessment of sparse

populations in forest inventory. Development and evaluation of probability sampling methods. Acta Universitatis Agriculturae Sueciae Silvestria 151. 1-33.

2. Shiver, B.D. & Borders, B.E. 1996. Sampling techniques for forest resources inventory. 356 p. (if the student has not examined the book earlier in B.Sc. level literature)
3. Vanclay, J.K. 1998. Towards more rigorous assessment of biodiversity. Pages 211-232. In: Bachmann, P., Köhl, M. & Päivinen, R. Assessment of biodiversity for improved forest planning. EFI proceedings no. 18.
4. Kangas, A. & Maltamo, M. (editors) 2006. Forest Inventory – Methodology and Applications. Springer Science & Business Media, Dordrecht. 362 pp.

#### **Remote sensing and GIS**

1. Fotheringham, S. & Wegener, M. 2000. Spatial Models and GIS. Taylor & Francis. 279 pp.
2. Malczewski, J. 1999. GIS and Multicriteria decision analysis. Wiley. 392 pp.
3. Riitters, K.H., O'Neill R.V., Hunsaker C.T., Wickham J.D., Yankee D.H., Timmins S.P., Jones K.B., and Jackson B.L.. 1995. A factor analysis of landscape pattern and structure metrics. Landscape Ecology 10:23-39.
4. Mather, P. 1999. Computer Processing of Remotely Sensed Images: An Introduction. Wiley. 292 pp.
5. Franklin, S.T. 2001. Remote sensing for sustainable forest management. CRC Press. 407 pp.

**Evaluation:** Examination.

#### **Advanced Studies in Remote Sensing (MINV12) 5 credits**

83424

**Timing:** Spring term, period III. Offered in even-numbered years.

**Responsible person:** Prof. (acting) Markus Holopainen, Prof. Juha Hyypä

**Relations to other study units:** GIS3, GIS12

**Objective:** To learn how to apply modern remote sensing methodologies in forestry.

**Contents:** Varying topics.

**Realisation and working methods:** Lectures 20 h, Practical work 40 h, Group work 20 h, Independent study 55 h

**Study materials and literature:** Literature will be handed out at the beginning of the course.

**Evaluation:** Exercises / Project work

## **Forest Mensuration and Management**

Forest Mensuration and Management is an applied science that relies on informatics, forest economics and biological sciences applied to the forest. This specialisation line helps a student to gain knowledge and skills in measuring the qualitative and quantitative characteristics of a tree, a forest stand and a larger forest area. It is possible to study Forest Mensuration and Management at the B.Sc. level.

#### **Teaching staff**

Professor Annika Kangas

Professor Markus Holopainen

Lecturer Hannu Rita

#### **Contact information**

Department of Forest Resource Management

P.O. Box 27

FI-00014 University of Helsinki

Finland

Tel. +358 9 191 58174

<http://mm.helsinki.fi/mmvar/english/>

#### **Courses in English**

##### **Teaching events in WebOodi**

#### **Multi-Attribute Forest Planning (MARV5/1)**

**6 credits**

83465

**Timing:** Autumn term, period II.

**Responsible person:** Professor Annika Kangas

**Relations to other study units:** MARV2

**Objective:** To familiarize students with theories of multi-criteria decision making and decision support systems. In addition, the course deals with forestry applications such as participatory planning and landscape ecological planning.

**Contents:** Utility theory, social choice theory, image theory, prospect theory, AHP, outranking, participation, group decision making, landscape-ecological planning.

**Realisation and working methods:** Lectures 24 h, Independent study 140 h

**Evaluation:** Examination

Department of Forest Resource Management

**Decision Support System (MARV5/2) 3 credits**

83466

**Timing:** Spring term

**Responsible person:** Professor Annika Kangas

**Relations to other study units:** MARV5/1

**Objective:** To familiarize students with multi-attribute forest planning in practise.

**Contents:** To collect information and prepare a recommendation to solve a real planning problem.

**Realisation and working methods:** Lectures 10 h, Group work 100 h

**Evaluation:** Accepted report.

## Courses in Finnish

**Basics of Forest Mensuration and Management (MARV1) 9 credits**

83401

**Timing:** Spring term, periods III and IV, 4-week field course in summer.

**Contents:** Defining, measuring and estimating tree and stand characteristics, land survey, forest inventory, and the basics of forest management.

**Forest Management Planning (MARV2) 4 credits**

83402

**Timing:** Autumn term, period I.

**Contents:** The concepts of sustainability, rotation, cutting budgets, practical forest planning, optimization, utility theory, multi criteria forest planning, planning packages, risk and uncertainty.

**Field Training Course in Forest Management Planning (MARV3) 5 credits**

83403

**Timing:** Preferably after the second academic year.

**Contents:** The collect field data and prepare a management plan for a private woodlot.

**Forest Inventory (MARV4/1) 4 credits**

83463

**Timing:** Spring term, periods III and IV. Offered in odd-numbered years.

**Contents:** Principles of forest inventory, sampling methods, stratification, forest inventory using modern methodology (remote sensing,

GIS and sampling-based forest inventory techniques).

**Inventory Project (MARV4/2) 5 credits**

83464

**Timing:** Spring term. Offered in odd-numbered years.

**Contents:** The use of theoretical knowledge of remote sensing, GIS and sampling-based forest inventory methods in practise.

## Geoinformatics

The Department of Forest Resource Management teaches Geoinformatics for the entire Viikki campus. Students will learn how to acquire, manage, analyse and visualise geographical information with the aid of GIS software and to plan application-specific information systems.

Geoinformatics introduces a map-based point of view into the analysis of digital data. Data are analysed with a map-based user interface utilising the latest database management techniques and spatial statistics. On the Viikki campus, geoinformatics is a branch of applied sciences that places a strong emphasis on natural resource applications and environmental applications as well as supporting research activities in other branches of science.

### Teaching staff

Professor N.N.

Assistant Juhana Nieminen

### Contact information

Department of Forest Resource Management /GIS

P.O. Box 27

FI-00014 University of Helsinki

Finland

Tel. +358 9 191 58174

Internet: <http://mm.helsinki.fi/mmvar/english/>

## Courses in English

### Teaching events in WebOodi

#### Desktop GIS (GIS1) 2 credits

83446

**Timing:** Autumn term, period I.

**Responsible person:** Timo Tokola

**Objective:** Introduction to basic use of simple GIS system

**Contents:** This is elementary course of GIS. Following issues are covered during the course: digitizing, coordinate transformations, spatial queries, visualization and data transfer.

**Realisation and working methods:** Lectures 10 h, Practical work 20 h, Independent study 20 h

**Evaluation:** Quality of practical work will be evaluated. No exams.

**Other information:** Lectures can be replaced by literature, and exercises are also introduced in English. This course uses e-learning materials and can be completed at any time using the WebCT learning environment and self-registration. Details and current course information can be obtained at <http://www.mm.helsinki.fi/gis/>

#### Use of GPS in Agriculture and Forestry (GIS2) 3 credits

83449

**Timing:** Autumn term, period I

**Responsible person:** Timo Tokola

**Objective:** Introduction to the use of GPS and attribute data collection

**Contents:** This course is a basic introduction to the use of GPS. Topics include coordinate systems, principles of GPS, GPS equipment, agricultural applications and forestry applications.

**Realisation and working methods:** Lectures 12 h, Practical work 20 h, Group work 20 h, Independent study 20 h

**Evaluation:** Writing essay, exercises 50% and final exam 50%.

**Other information:** Lectures can be replaced by literature, and exercises are also introduced in English. Details and actual course information can be obtained from the internet <http://www.mm.helsinki.fi/gis/>

#### Principles of GIS (GIS4) 4 credits

83439

**Timing:** Spring term, periods III and IV. This course uses e-learning materials and can be

completed at any time using the Webct learning environment and self-registration.

**Objective:** The purpose of this course is to teach principles of geoinformatics. After completing the course successfully, students will be able to solve spatial problems using the GIS system.

**Contents:** This is basic elementary course of GIS. Following issues are covered during the course GIS data models, Formats, Topology, Geometry, Vector Analysis, Interpolation, Raster Analysis, GIS systems and software, and Application development.

**Realisation and working methods:** Lectures 24 h, Practical work 72 h, Group work 5 h, Independent study 10 h

**Evaluation:** Preliminary test (pass), exercises (50 %) and final exam (50%).

**Other information:** The course begins with a preliminary exam. Lectures are replaced with literature and exercises are also introduced in English. Details and current course information can be obtained from the internet <http://www.mm.helsinki.fi/gis/>

#### GIS in Logistics and Business (GIS13) 5 credits

83450

**Timing:** Autumn term. Offered in even-numbered years.

**Responsible person:** Prof. Bo Dahlin

**Relations to other study units:** GIS4

**Objective:** Course will introduce business GIS methods and applications.

**Contents:** This business-oriented GIS course introduces the basics of logistical and business analysis applications in a GIS environment. ArcGIS software will be used during exercises and a relatively extensive project will be finished during the study period.

**Realisation and working methods:** Lectures 20 h, Practical work 30 h, Group work 10 h, Independent study 50 h

**Evaluation:** Course will be rated using exam (40%), exercises (30%) and practical work (30%).

**Other information:** Details and actual course information can be obtained from the internet <http://www.mm.helsinki.fi/gis/>

#### Environmental GIS (GIS14) 5 credits

83454

**Timing:** Spring term. Offered in odd-numbered years.

**Relations to other study units:** GIS4

**Objective:** The aim of course is to demonstrate environmental GIS analysis and GIS project implementation.

**Contents:** The course concentrates on GIS applications of the environmental sciences

**Realisation and working methods:** Lectures 20 h, Practical work 30 h, Group work 10 h, Independent study 70 h

**Evaluation:** Final grades are determined according to quality of reports on the practical work (30%) and the final exam (70%).

**Other information:** Details and actual course information can be obtained from the internet <http://www.mm.helsinki.fi/gis/>

#### **Application Development and Applied WebGIS (GIS15) 5 credits**

83455

**Timing:** Spring term. Offered in odd-numbered years.

**Responsible person:** Prof. N.N., M.Sc. Jussi Rasinmäki

**Relations to other study units:** GIS4

**Objective:** The aim of course is to learn GIS software and application development project implementation.

**Contents:** The course concentrates on GIS applications for the sustainable use of natural resources, taking the special features of nature in planning and resource mapping into account. Special emphasis on the use UML in database design, use of database with SQL language and GIS software development in a WebGIS environment.

**Realisation and working methods:** Lectures 10 h, Practical work 40 h, Independent study 80 h

**Evaluation:** Final grades are determined according to quality of reports on practical work (100%).

**Other information:** Details and actual course information can be obtained from internet <http://www.mm.helsinki.fi/gis/>

### **Courses in Finnish**

#### **Remote Sensing 1 (GIS3) 3 credits**

80010

**Contents:** Introduction to physical principles of remote sensing, aerial photographs and radar images and their utilisation in mapping the environment and forest resources.

#### **Geostatistics and Geomodeling (GIS10) 5 credits**

83440

**Timing:** Spring term, periods III and IV.

**Contents:** The course is concentrating into spatial statistics and modeling. The topics include mapping distances, allocation, shortest path, accumulation surfaces, interpolating to raster, kriging methods, terrain analysis, landscape indices and watershed analysis. The statistical issues during the course include point, line and pattern statistics as well as different zonal statistics. Some spatial simulation techniques and probability models are covered during the course.

#### **Applied GIS Analysis (GIS11) 5 credits**

83441

**Timing:** Autumn term, periods I and II.

**Contents:** The course concentrates on the GIS applications of the sustainable use of natural resources. Takes the special features of nature in planning and resource mapping into account. Emphasis on the use of a database with SQL language to calculate application-specific features such as landscape-level diversity indices.

#### **Remote Sensing 2 (GIS12) 5 credits**

83443

**Contents:** The lectures and training deal with remote sensing problems. The examples are of forestry, but the methods can be applied in other sciences. Course organization: Lectures given by experts.



## Logistics

Forest Logistics deals with logistical management in general and the logistics of the forest sector in particular. Logistics includes the design and administration of systems to control the flow of material to support business strategies. To achieve this, logistics incorporates expertise from several other disciplines dealing with technology, planning methodology and business economics. Transportation, inventories, planning processes, control mechanisms, and supply chain management are examples of issues of interest. Teaching consists of lectures, excursions, practical exercises, seminars and literature surveys.

### Teaching staff

Prof. Bo Dahlin

### Contact information

Department of Forest Resource Management  
P.O. Box 27

## Courses in English

### Teaching events in WebOodi

#### Basics of Logistics (LOG1) 3 credits

84201

**Timing:** Autumn term, II period

**Responsible person:** Prof. Bo Dahlin

**Objective:** To give students an overall view of the modern logistics, its technological solutions and methodology to solve the problems in transporting goods.

**Contents:** Transportation solutions for collection and distribution of basic products such as wood, chips, grain etc. Introduction to methods of steering and management of logistics.

**Study materials and literature:** Distributed during course

**Evaluation:** Examination

#### Advanced Supply Chain management (LOG2) 6 credits

84202

**Timing:** Given in odd-numbered years starting autumn 2007

**Responsible person:** Professor Bo Dahlin

**Relations to other study units:** LOG1

**Objective:** To give a deeper understanding of modern logistics of the use of business models as well as tools and solutions for management.

**Contents:** Procurement of raw material. Distribution logistics. Logistics as part of the business model. Information logistics. Examples from forest and agricultural industries.

**Study materials and literature:** Distributed during course

**Evaluation:** Examination, project work.

## Courses in Swedish:

#### Forestry around the Baltic Sea (FOR310) 3 credits

830091

# REGULATIONS AND GUIDELINES

## Standing Regulations Concerning Degrees in the Faculty of Agriculture and Forestry

The Finnish-language original approved by the Faculty Council Meeting of the Faculty of Agriculture and Forestry, 19 May 2005, item A3. Amendments to sections 5, 13 and 32 approved by the Faculty Council on 11 May 2006

### CHAPTER 1

#### Section 1 General provisions

Degrees and studies shall be arranged and completed in the manner stipulated by the Universities Act (645/1997) and its amendment (715/2004), the Universities Decree (115/1998), the Government Decree on University Degrees (794/2004), the University of Helsinki Regulations (confirmed by the Chancellor on 14 February 2003), the Regulations concerning examinations, grading of completed studies and the Board of Examination Appeals (confirmed by the Chancellor on 17 February 1999) and the Regulations concerning the degree of Doctor of Philosophy at the University of Helsinki, as well as these Standing Regulations.

### CHAPTER 2

#### EDUCATIONAL DUTY OF THE FACULTY OF AGRICULTURE AND FORESTRY AND DEGREES AND STUDIES OFFERED BY THE FACULTY

#### Section 2 Duty of the Faculty

The duty of the Faculty of Agriculture and Forestry of the University of Helsinki is to conduct and promote scientific research and to provide teaching based on research in the fields of agricultural sciences, forestry sciences, food science and nutrition and in all aspects of economics and environmental sciences that are relevant to the above-mentioned fields.

#### Section 3 Degrees and studies offered by the Faculty

The following degrees are available at the Faculty:

1. the lower academic degrees of Bachelor of Science (Agriculture and Forestry) and Bachelor of Food Sciences;
2. the higher academic degrees of Master of Science (Agriculture and Forestry) and Master of Food Sciences; and
3. the postgraduate degrees of Licentiate of Science (Agriculture and Forestry), Licentiate of Food Sciences, Doctor of Science (Agriculture and Forestry), Doctor of Food Sciences and Doctor of Philosophy.

The Faculty offers education leading to the degrees of Bachelor of Science (Agriculture and Forestry), Master of Science (Agriculture and Forestry), Licentiate of Science (Agriculture and Forestry), Doctor of Science (Agriculture and Forestry) and Doctor of Philosophy in the following major subjects: Biotechnology, Biology of Plant Production, Animal Science, Consumer Economics, Soil and Environmental Science, Agricultural Economics, Agricultural and Environmental Engineering, Marketing, Forest Ecology, Forest Economics, Forest Resource Science and Technology, Microbiology, and Forest Products Marketing, Environmental Economics.

The Faculty offers education leading to the degrees of Bachelor of Food Sciences, Master of Food Sciences, Licentiate of Food Sciences, Doctor of Food Sciences and Doctor of Philosophy in the following major subjects: Biotechnology, Food Economics, Food Chemistry, Food Technology, Marketing, Microbiology, and Nutrition.

In the majors of Biotechnology, Marketing, and Microbiology, the requirement for obtaining the degrees of Bachelor and Master of Food Sciences is either basic studies in food sciences (25 credits) or minor subject studies worth 25 credits in one of the following major subjects: food chemistry, food technology or nutrition.

The major subjects may include specialisation lines to be separately decided by the Faculty Council.

The Faculty is participating in the Helsinki Region Biotechnology Educational Programme, which is a joint venture between the Faculty of Biosciences, the Faculty of Pharmacy, the Faculty of Science, and the Helsinki University of Technology and the Helsinki School of Economics. The coordinator of the programme is the Faculty of Biosciences. The degree requirements of the Helsinki Region Biotechnology Educational Programme must be approved by the Faculty Council of the Faculty of Agriculture and Forestry and by the Faculty departments involved in the programme.

The Faculty may offer independent Master's programmes as separately decided by the Faculty Council.

In addition, the Faculty may offer:

1. non-degree studies, which may be part of a degree programme or studies especially designed and organised as non-degree studies, and
2. continuing education, which may be part of a degree programme or studies especially designed and organised as continuing education.

### **CHAPTER 3**

#### **THE LOWER ACADEMIC DEGREE**

##### **Section 4 Completion of the lower academic degree, i.e., the Bachelor's degree**

The minimum requirement for the degrees of Bachelor of Science (Agriculture and Forestry) and Bachelor of Food Sciences is 180 credits. The studies must be planned in such a way as to allow the student to complete the degree in three years of full-time study. The student must draw up a personal study plan. The student must complete basic and intermediate level studies in the major subject, minor subject studies, language studies, studies in ICT, practical training or orientation to working life, and any other studies specified in the degree requirements. Furthermore, the student must write a Bachelor's thesis.

The scope of the basic level studies in the major subject is 25 credits and the total number of credits obtainable from intermediate level studies, together with basic level studies but excluding the Bachelor's thesis, is between 60 and 90.

NB! Students in their Bachelor's level studies who intend to complete the Master's degree as well should consult Section 12, Subsection 2 of these Standing Regulations.

##### **Section 5 Minor subject studies**

The minimum requirement for minor subject studies in the Bachelor's degree is 25 credits worth of basic level studies in at least one minor subject. It is possible to incorporate into the Bachelor's degree a module completed in accordance with the degree requirements of another university or institute of higher education and yielding a minimum of 25 credits, for which the student has received an overall grade. The minor subject to be included in the degree must be approved by the major subject department.

According to the degree requirements of the Faculty of Agriculture and Forestry, minor subject students are offered 25 credits of basic studies or a total of 60 credits of basic and intermediate studies. Minor subject students interested in completing an intermediate-level minor subject module in the Faculty must seek the approval of the professor in charge of the relevant field of research and teaching.

##### **Section 6 Language studies**

The requirements for the Bachelor's degree include a minimum of 10 credits worth of language studies and comprise oral and written communication in the native language, studies in the student's second national language and studies in at least one foreign language. The language studies may be integrated with other studies.

#### *Native language*

Studies in the native language provide students with the competence to communicate orally and in writing in their native language.

#### *National language*

The objective of studies in the second national language (Finnish or Swedish, not the student's native language) is to provide students with a competence corresponding to the language requirements of state personnel with a university degree and working in bilingual authorities, as specified in Act No. 424/2003 and Decree No. 481/2003 on the knowledge of languages required of personnel in public bodies. Furthermore, in the studies in the second national language, students are expected to attain a level that is needed to successfully complete studies, follow developments in the field and maintain professional development.

Students who have in their Finnish matriculation examination been exempted from the test in the second national language and students who have not completed a test in the second national language for their International Baccalaureate, European Baccalaureate or Reifeprüfung examinations are not required to complete studies in the second national language. However, these students must complete an adequate number of credits in other languages to meet the degree requirements.

#### *Foreign language*

The objective of the foreign language requirement is to enable students to read academic texts in their own field, to follow and make general conversation, and to make basic-level professional conversation in their own field. The languages on offer include English, Spanish, Italian, French, German and Russian, or some other language approved by the Dean.

#### *Students who have completed their secondary education in languages other than Finnish or Swedish*

Students who have completed their secondary education in languages other than Finnish or Swedish, or who have completed their secondary education abroad are required to complete a minimum of 10 credits worth of studies in a minimum of one language foreign to the student.

#### *Exemption from the language requirement*

The Dean may, for a special reason, grant a student partial or total exemption from language studies.

### **Section 7 Studies in information and communication technology**

The purpose of studies in ICT is to provide students with skills enabling them to study efficiently at the University. The minimum scope of these studies is 5 credits, three of which must be completed for the Bachelor's degree. The studies in ICT may be integrated with other studies.

### **Section 8 Personal study plan**

The purpose of the personal study plan is to support goal-oriented studies. The Bachelor's degree must include a minimum of 1-3 credits worth of study planning by the student. The writing of the personal study plan and the relevant supervision may be integrated with other studies.

### **Section 9 Practical training or orientation to working life**

The requirements for the Bachelor's degree include either practical training to develop the student's professional expertise or studies that support the student's orientation to working life. The purpose of these studies, which are 1-3 credits in scope, is to introduce the student to the basic professional practices of his or her field and to develop the student's ability to apply acquired theoretical knowledge in his or her professional duties.

### **Section 10 Bachelor's thesis**

The thesis required for the Bachelor's degree is to be written in the major subject. The thesis should demonstrate the student's familiarity with the topic and proficiency in academic writing. The scope of the Bachelor's thesis is 6 credits. The departments and major subject divisions are responsible for the supervision and grading of Bachelor's theses.

### **Section 11 Maturity essay**

For the Bachelor's degree, students are required to write a maturity essay, which is an essay demonstrating familiarity with the field of their Bachelor's thesis and their competence in their native language (Finnish or

Swedish). In cases where the student has been exempted from the language requirement of the degree, he or she may, at the discretion of the professor in charge of the field, write the maturity essay in a language other than Finnish or Swedish.

## **CHAPTER 4**

### **THE HIGHER ACADEMIC DEGREE**

#### **Section 12 Completion of the higher academic degree, i.e., the Master's degree**

The minimum requirement for the degrees of Master of Science (Agriculture and Forestry) and Master of Food Sciences is 120 credits. The studies must be planned in such a way as to allow the student to complete the degree in two years of full-time study. The student must draw up a personal study plan. The student must complete advanced level studies in the major subject and write a Master's thesis. Furthermore, the student must complete studies in ICT, practical training or orientation to working life, and any other studies specified in the degree requirements.

The scope of advanced level studies in the major subject is at least 70 credits, 40 of which are accounted for by the Master's thesis. Before completing the degrees of Bachelor of Science (Agriculture and Forestry) and Bachelor of Food Sciences, students are allowed to complete a maximum of 20 credits of advanced level studies in their major subject.

#### **Section 13 Minor subject studies**

Minor subject studies are normally completed for the Bachelor's degree. If this has not been the case, minor subject studies, as defined in Subsection 5 of these Standing Regulations, must be completed for the Master's degree.

According to the degree requirements of the Faculty of Agriculture and Forestry, minor subject students are offered 60 credits of advanced studies, including a 30-credit thesis. The professor in charge of the relevant field of research and teaching is responsible for examining and approving the thesis. To receive the right to complete advanced studies as a minor subject, a student must first complete the preceding intermediate studies or equivalent studies. Minor subject students interested in completing an advanced-level minor subject module in the Faculty must seek the approval of the professor in charge of the relevant field of research and teaching.

#### **Section 14 Language studies**

Language studies are normally completed for the Bachelor's degree. If this has not been the case, language studies, as defined in Subsection 6 of these Standing Regulations, must be completed for the Master's degree.

#### **Section 15 Studies in information and communication technology**

The purpose of studies in ICT is to provide students with skills enabling them to study efficiently at the University. The minimum scope of these studies is 5 credits, three of which must be completed for the Bachelor's degree. The studies in ICT may be integrated into other studies. If the student has not completed any studies in ICT for the Bachelor's degree, he or she must complete a minimum of 5 credits worth of studies in ICT for the Master's degree.

#### **Section 16 Personal study plan**

The purpose of the personal study plan is to support goal-oriented studies. The Master's degree must include a minimum of 1-2 credits worth of study planning by the student. The writing of the personal study plan and the relevant supervision may be integrated with other studies.

#### **Section 17 Practical training or orientation to working life**

The requirements for the Master's degree include either practical training to develop the student's professional expertise or studies that support the student's orientation to working life. The purpose of these studies is to familiarise the student with the professional tasks of his or her field and to develop the student's ability to apply theoretical knowledge in his or her professional duties. The practical training or orientation to working life may be integrated with other studies, such as research projects.

### **Section 18 Master's thesis**

The thesis required for the Master's degree is to be written in the major subject. The topic of the thesis should be a problem of scientific relevance and importance to the Faculty's areas of responsibility. The thesis should demonstrate the student's ability for scientific thinking, competence in the relevant research methods, familiarity with the topic and proficiency in academic writing. The scope of the Master's thesis is 40 credits.

### **Section 19 Maturity essay**

For the Master's degree, students are required to write a maturity essay, which is an essay demonstrating familiarity with the field of their Master's thesis and their competence in their native language (Finnish or Swedish). Students need not write a maturity essay in Finnish or Swedish for the Master's degree, if they have already written a maturity essay in Finnish or Swedish for their Bachelor's degree.

In cases where the student has been exempted from the language requirement of the degree, he or she may, at the discretion of the professor in charge of the field, write the maturity essay in a language other than Finnish or Swedish.

## **CHAPTER 5 STUDENT ADMISSION AND CHANGE OF MAJOR SUBJECT**

### **Section 20 Student admission**

Student admission is regulated separately by the Universities Act (645/1997) and its amendment (715/2004), and by the annual decisions of the University Senate and the Faculty Council of the Faculty of Agriculture and Forestry.

The Faculty Council of the Faculty of Agriculture and Forestry decides annually on the admission criteria for new students. An Admissions Committee appointed by the Faculty Council is responsible for preparing the criteria for admission and for the implementation of the admissions process.

### **Section 21 Change of major subject**

A student may change his or her major subject with the permission of the Dean. The Dean will make the decision on the basis of a statement by the steering committee of the department to which the student wishes to transfer, taking into account the number of students registered as students of the new major subject and the study options available. If the student wishes to change to a new major subject within the same department, the decision is made by the department's steering committee.

In order to change major subjects, the student must have completed at least the basic studies (25 credits) in the original major subject to which he or she was admitted at the Faculty and at least 25 credits of basic and/or intermediate studies in the major subject to which he or she is applying for transfer.

### **Section 22 Students from other faculties**

Students from other faculties at the University of Helsinki have the right to include studies completed in accordance with the curriculum of the Faculty of Agriculture and Forestry in their degree within the limits of the Faculty's teaching resources and to an extent considered appropriate by the Faculty.

## **CHAPTER 6 SCIENTIFIC POSTGRADUATE STUDIES**

### **Section 23 The major subject of the postgraduate degree**

The Faculty offers postgraduate degree programmes leading to the degrees of Licentiate or Doctor in Agriculture and Forestry or Food Sciences or Doctor of Philosophy as specified in Section 3 of these Standing Regulations.

### **Section 24 Eligibility for postgraduate studies**

A person can be deemed eligible for studies leading to an academic postgraduate degree if he or she has completed an appropriate higher academic (i.e. a Master's level) degree at a Finnish university or an

appropriate academic degree abroad qualifying him or her for postgraduate studies in that country or is considered by the Faculty to be adequately qualified for postgraduate studies.

#### **Section 25 The right to pursue postgraduate studies and the postgraduate study plan**

A person applying for admission to scientific postgraduate studies must submit an application to the Faculty. The right to pursue postgraduate studies is granted by the Dean. In order to be admitted for postgraduate studies, the student should have demonstrated a sufficiently high level of academic performance in the major subject of his or her Master's degree and in the Master's thesis.

The student has the right to choose a different major subject for postgraduate studies than the major subject of his or her Master's degree, if the Faculty considers him or her eligible for postgraduate studies in the new major subject. In order to be considered eligible, the student must have completed at least 100 credits in the postgraduate major subject or in an equivalent subject.

The student must submit a postgraduate study plan to the Committee for Research and Postgraduate Education within one year of being accepted for postgraduate studies. The postgraduate study plan is approved by the Dean.

#### **Section 26 Completion of a doctoral degree**

In order to complete the degree of Doctor of Agriculture and Forestry or Food Sciences, or the degree of Doctor of Philosophy, a student who has been accepted for postgraduate studies must complete the following:

1. A minimum of 60 credits of postgraduate studies in accordance with the study plan; and
2. A doctoral dissertation that demonstrates an independent and critical approach to the field of research and is approved by the Faculty after being defended at a public examination.

A doctoral dissertation can be a monograph or it can be in the form of an article dissertation, i.e., a collection of several separate scientific articles or manuscripts that have been accepted for publication and that all focus on the same topic. An article dissertation must always contain a summary. Regardless of its format, the work should meet the scientific criteria set for a doctoral dissertation. Co-authored publications may be included if the author's independent contribution to them can be verified. At least half of the articles included in a compilation dissertation should previously have been published or been accepted for publication.

#### **Section 27 Completion of a Licentiate degree**

A student accepted for postgraduate studies can complete the Licentiate degree provided that he or she has completed the studies referred to in Section 26, subsection 1 and has written a Licentiate thesis that demonstrates the student's familiarity with the field of research and his or her competence in the independent and critical application of scientific research methods.

A Licentiate thesis can be a monograph or it can be in the form of an article thesis, i.e., a collection of several separate scientific articles or manuscripts that have been accepted for publication and that all focus on the same topic. An article thesis must always contain a summary. Regardless of its format, the work should meet the scientific criteria set for a thesis of its kind. Co-authored publications may be included if the author's independent contribution to them can be verified. At least half of the articles included in an article thesis should previously have been published or been accepted for publication.

#### **Section 28 Other provisions for postgraduate studies**

The postgraduate studies referred to in Section 26, subsection 1 (60 credits) must be completed before the examiners of the Licentiate thesis or the pre-examiners of the doctoral dissertation are appointed. If the required studies have not been completed, a report of the missing courses and their planned completion must be enclosed in the proposal for the appointment of the examiners or pre-examiners.

The Faculty of Agriculture and Forestry has issued separate instructions on the examining, approval, and publishing of Licentiate theses and doctoral dissertations.

The Faculty Council will decide separately on the issuing of more detailed guidelines for postgraduate studies.

## **CHAPTER 7**

### **MISCELLANEOUS REGULATIONS**

#### **Section 29 Elective studies**

The student may pursue elective studies in another faculty, university or institution of higher education.

#### **Section 30 Recognition of credits**

Other studies or degrees completed at a Finnish or foreign university may be counted towards a degree at the Faculty of Agriculture and Forestry, provided that the objectives of the degree are met. The Faculty Council will decide separately on the principles of credit recognition.

#### **Section 31 Grading of studies**

Courses, study modules (basic, intermediate and advanced studies), Bachelor's theses, and theses for advanced studies in minor subjects are graded on a scale of 0 – 5, in which 5 = Excellent, 4 = Very Good, 3 = Good, 2 = Passable, 1 = Poor, and 0 = Fail. In certain cases in which it is not practical to use the scale 0 – 5, courses can be graded Pass/Fail.

When assessing study modules, the final grade is marked only if at least half the completed courses in the module have received a grade. This applies mainly to cases in which the modules cannot be assessed because some of the courses have been substituted with studies completed previously. The diploma must, however, always contain a final grade for the major subject; this grade is assessed using the available grades for the completed study modules. The final grade for a study module is a weighted average of the credits obtained from the courses in the module. The grade for the Master's thesis is not taken into consideration in the final grade for the advanced studies module. The study modules are entered in the Student Register as fixed units.

An approved Master's thesis can receive one of the following grades: approbatur, lubenter approbatur, non sine laude approbatur, cum laude approbatur, magna cum laude approbatur, eximia cum laude approbatur, or laudatur.

Language skills in the student's second national language are graded Passable/Good.

The maturity essay is graded Pass/Fail.

The Licentiate thesis and doctoral dissertation are graded Rejected, Approved or Approved with distinction.

#### **Section 32 Expiry of credits**

The validity of credits older than 10 years is determined by the relevant department. The department can, however, also decide on a shorter period of validity. Credits yielded by language studies will not expire.

#### **Section 33 The titles of agronomi and metsänhoitaja**

The Faculty of Agriculture and Forestry can, upon request, entitle a student holding a Bachelor's degree in Agriculture and Forestry or equivalent qualifications and a Master's degree in one of the following major subjects to use the title of agronomi: Biotechnology (plant biotechnology and animal biotechnology), Biology of Plant Production, Animal Science, Soil and Environmental Science, Agricultural Economics, Agricultural and Environmental Engineering, Marketing, and Environmental Economics.

In order to obtain the title of agronomi, the student must have completed a minimum of 25 credits in subjects in the agricultural sciences. The Faculty Council makes the decision as to which studies are required.

The Faculty of Agriculture and Forestry can, upon request, entitle a student holding a Bachelor's degree in Agriculture and Forestry or equivalent qualifications and a Master's degree in one of the following major subjects to use the title of metsänhoitaja: Forest Ecology, Forest Economics, Forest Resource Science and Technology, and Forest Products Marketing.

The title will be indicated on the diploma.



## **CHAPTER 8**

### **ENTRY INTO FORCE**

#### **Section 34 Entry into force of the Standing Regulations**

These Standing Regulations will enter into force on 1 August 2005.

Students who have begun their studies before the entry into force of these Standing Regulations have the right to transfer to the new degree system and complete their degree in accordance with the Government Decree on University Degrees (794/2004), in which case the student must also comply with the new Standing Regulations. The student must notify the Faculty in writing of the transfer to the new degree system. The transfer cannot be reversed. The student will (automatically) transfer to the new degree system in accordance with Decree No. 794/2004 and these Standing Regulations if he or she has not completed one of the following degrees by 31 July 2008 in accordance with the previous Standing Regulations: Bachelor, Master, Licentiate or Doctor of Science in Agriculture and Forestry; Bachelor, Master, Licentiate or Doctor of Science in Food Sciences; or Doctor of Philosophy.

#### **Section 35 Degrees completed in accordance with decrees in force prior to the year 1995**

As of 1 August 1995, students who have completed the degrees of maatalous- ja metsätieteiden kandidaatti or elintarviketieteiden kandidaatti (the equivalent of Master of Science in Agriculture and Forestry or Food Sciences) in accordance with decrees in force prior to the year 1995 may use the title Master of Science in Agriculture and Forestry or Food Sciences.'

## **Guidelines for Postgraduate Studies at the Faculty of Agriculture and Forestry**

Approved at the Faculty Council meeting, 8 September, 2005.

### **SCIENTIFIC POSTGRADUATE STUDIES**

In order to qualify for postgraduate studies at the Faculty of Agriculture and Forestry, applicants must have completed a basic degree or training that meets the Faculty requirements for the postgraduate studies programme.

The applicant should have

- a) an appropriate higher university degree, i.e. a Master's-level degree; or
- b) an appropriate foreign university degree that qualifies the applicant for corresponding postgraduate studies in that country; or
- c) otherwise proven skills and sufficient knowledge for scientific postgraduate studies.

In addition, the student should have demonstrated a sufficiently high level of academic performance in his or her major subject and Master's thesis. If not, the student can provide additional proof of his or her skills in a manner agreed on with the professor in charge, e.g. in the form of an extensive essay or a manuscript for a scientific article, or by taking an examination.

The aim of scientific postgraduate studies is for the student to

- 1) become profoundly familiar with his or her field of research and its impact on society, and acquire the ability to independently and critically apply scientific research methods and contribute to new scientific knowledge within the field;
- 2) become well-versed in the development, basic problems and research methods of his or her discipline;
- 3) acquire a level of knowledge of general scientific theory, and of the disciplines related to his or her field of research, that permits him or her to follow future developments.

Postgraduate degrees offered by the Faculty are Licentiate and Doctoral degrees: Licentiate of Science in Agriculture and Forestry; Licentiate of Food Sciences; Doctor of Science in Agriculture and Forestry; Doctor of Food Sciences; and, Doctor of Philosophy. When approving the application for postgraduate studies, the Faculty will decide on the basis of the applicant's previous studies and the topic of the planned doctoral dissertation or Licentiate thesis to what degree the applicant's postgraduate studies will lead.

### **How to apply**

Postgraduate degrees can be completed in all the major subjects specified in Section 3 of the Standing Regulations of the Faculty of Agriculture and Forestry. If the major subject comprises several specialization lines approved by the Faculty Council, eligibility for postgraduate studies in a major subject can be specified for a particular specialization line. The application is for the right to pursue a doctoral degree, but also comprises the right to complete a Licentiate degree. The application should be submitted in writing to the Faculty of Agriculture and Forestry. Application forms for postgraduate studies and for drawing up a postgraduate study plan can be downloaded from the Faculty website. The application process varies slightly depending on the student's previous degree and where it was completed.

#### **1) Applicants who have graduated from the Faculty of Agriculture and Forestry**

A student with a Master's degree from the Faculty of Agriculture and Forestry may be granted the right to pursue studies leading to a doctorate in Agriculture and Forestry or Food Sciences, provided the applicant has demonstrated a sufficiently high level of academic performance and the professor in charge supports the application. The student should have received a final grade of at least 3 (previously Good or 2-/3) in his or her major subject and a minimum grade of non sine laude approbatur for his or her Master's thesis.

If the student is applying for the right to pursue studies in a different major subject from the one in which his or her previous degree was completed, the professor in charge of the postgraduate major subject should write a well-founded statement on the applicant's eligibility for studies in that subject. In order to

be considered eligible for postgraduate studies, the student should have completed a minimum of 100 credits in the major subject of the postgraduate degree programme or in other equivalent studies. The credits can be from basic, intermediate or advanced-level studies or other studies relevant to the major subject. If necessary, the student must complete supplementary studies in the postgraduate major subject in a manner agreed on with the professor in charge. The professor's statement should be enclosed in the application. The supported application and enclosures should be submitted to the Faculty Office (Student Affairs). The procedure above can also be applied within the major subject if the student wishes to change specialization lines.

2) Applicants who have graduated from another faculty at the University of Helsinki or from another Finnish university

A student with a Master's degree from another faculty at the University of Helsinki or from another Finnish university may be granted the right to pursue studies leading to a doctorate in Agriculture and Forestry or Food Sciences or to the degree Doctor of Philosophy, provided the applicant has demonstrated a sufficiently high level of academic performance and the professor in charge supports the application. The professor in charge of the postgraduate major subject should write a well-founded statement on the applicant's eligibility for studies in that subject. The student should have completed a minimum of 100 credits in the major subject of his or her postgraduate degree programme or in other equivalent studies. If the student has completed the credits in the major subject of the degree programme, the degrees of Licentiate or Doctor of Agriculture and Forestry or Food Sciences are available; if the credits have been completed in a subject corresponding to the postgraduate major subject, the degree is that of Doctor of Philosophy. The credits can be from basic, intermediate or advanced-level studies or other studies relevant to the major subject. If necessary, the student must complete supplementary studies in the postgraduate major subject in a manner agreed on with the professor in charge. The professor's statement should be enclosed in the application. The application should also include an officially certified copy of the student's diploma and a transcript of completed studies. The application, complete with enclosures, should be submitted to the Faculty Office (Student Affairs).

3) Applicants who have completed their Master's degree abroad

Students who have obtained eligibility for postgraduate studies abroad should apply for postgraduate studies using the application form for international students (available from Student Information and Counselling or from <http://www.helsinki.fi/admissions/>). The application form and required enclosures should be submitted to the Faculty Office. The professor responsible for the postgraduate major subject should write a statement on the applicant's eligibility for studies in that subject. If necessary, the student must complete supplementary studies in the postgraduate major subject in a manner agreed on with the professor in charge.

The applications are reviewed by the Committee for Research and Postgraduate Education appointed by the Faculty Council. The right to pursue postgraduate studies is granted by the Dean. If the student is accepted, he or she will be sent instructions for enrolment. The student should return the enrolment documents to the Faculty Office, which will then send the documents to the Student Register where the information will be transferred into the Oodi student register. The Student Register will notify the student of his or her registration and student number.

### **Postgraduate study plan**

When applying for the right to pursue postgraduate studies the student must include a preliminary postgraduate study plan (including an outline of the intended studies and research topic). The student must present a detailed study plan within a year of being accepted for postgraduate studies.

The student should draw up the study plan together with his or her supervisor or the professor in charge, using a form available on the Faculty website. At this point the student should also have a research plan that has been approved by the professor, and a financing plan. A field-specific monitoring group can be appointed to provide scientific support for the dissertation or thesis work. If the dissertation or thesis work is being done outside the Faculty, both the relevant Faculty department and the place of research must be represented in the monitoring group.

The student's study plan must be approved by the professor in charge of the major subject. If the supervisor is someone other than the professor, the study plan requires the approval of both persons. The completed and approved study plan form should be submitted to the Faculty Office. The plans are reviewed for consistency by the Committee for Research and Postgraduate Education and approved by the Dean. If, over time, an approved postgraduate study plan needs to be slightly revised, the professor is authorized to approve changes of up to 20 credits. Significant changes have to be reviewed by the Committee for Research and Postgraduate Education. If, upon completing a Licentiate degree, the student continues to study the same major subject, there is no need to draw up a new study plan.

### **Degree requirements**

A student who has been accepted for scientific postgraduate studies must complete the following:

- 1) A minimum of 60 credits of postgraduate studies in accordance with the study plan; and
- 2) A Licentiate thesis and/or a doctoral dissertation that demonstrates an independent and critical approach to the field of research and is approved by the Faculty after being defended at a public examination.

The purpose of the postgraduate studies referred to in item 1 is to form the necessary knowledge base for the Licentiate thesis or doctoral dissertation. The student should integrate his or her studies and research work in such a way that when the thesis is submitted for examination, the studies will have been completed. The postgraduate studies referred to in item 1 must be completed before the examiners of the Licentiate thesis or the pre-examiners of the doctoral dissertation are appointed. If the required studies have not been completed, a report of the missing courses and their planned completion must be enclosed in the proposal for the appointment of the examiners or pre-examiners.

The student may not use previously completed studies that have already been included in the Master's degree in his or her postgraduate degree.

If the student wishes to pursue another, same-level postgraduate degree, he or she must complete another set of postgraduate studies (60 credits).

Students pursuing the Licentiate and Doctoral degrees must complete 60 credits of postgraduate studies as follows:

#### **I GENERAL POSTGRADUATE STUDIES (min. 15 credits)**

- Language studies (max. 6 credits)
- Methodology
- Applied ethics
- Philosophy of science
- The research process
- Popularization of research data
- Research policy and management
- Research funding and planning
- Studies in university-level teaching and practical training (max. 5 credits)
- Studies related to the commercial use of research results
- Scientific publications (max. 5 credits)

#### **II FIELD-SPECIFIC STUDIES (min. 45 credits)**

##### **Major and minor subjects (10-35 credits)**

- Field-specific postgraduate studies
- Major subject literature exam
- Postgraduate seminars
- Conference presentations and posters (max. 6 credits)
- International expert assignments (max. 3 credits)

##### **Field-specific methodology studies (10-35 credits)**

- Studies in scientific research methods (specific to field of research and research topic)

## I GENERAL POSTGRADUATE STUDIES

General postgraduate studies should comprise courses that support the student's research work, *e.g.* studies in applied ethics, scientific publication, the popularization of research data, research policy and management, research funding and planning, and university-level teaching and learning.

Studies in the theory of science offered by the Faculty include the following courses: The Research Process, Philosophy of Science, and Methodology. It is advisable for the student to complete the course The Research Process at the very beginning of his or her studies. The courses Philosophy of Science and Methodology can also be completed by taking a book examination. A reading list for the examination is available on the Faculty website. Other options must be discussed separately with the teacher responsible for the course in question.

The Faculty recommends that the student take a course in academic writing, such as Academic Scientific Writing. Further information on language studies may be obtained from the University's Language Centre (see <http://www.helsinki.fi/kksc/>). The maximum number of credits in language studies allowed in a postgraduate study plan is 6.

The postgraduate study plan may include a maximum of 5 credits' worth of scientific articles that are not a part of the dissertation work.

Studies and practical training in university-level teaching and learning may be included in the study plan for a maximum number of 5 credits.

## II FIELD-SPECIFIC STUDIES

Field-specific studies include courses in the major and minor subjects and field-specific methodology courses, and should total at least 45 credits. The student may emphasize studies from either group according to his or her research topic. As a rule, the studies should be intermediate or advanced courses and the subject matter should contribute to the student's dissertation/thesis work.

The study plan should contain as much detailed information as possible on the courses the student plans to complete: name of course, code, level, credits, time and place of completion. If the course takes place or has taken place elsewhere than at a university in Finland or abroad, a course description should be included. In order to complete a course the student must pass an examination or write a report or complete a written assignment, or produce some other form of written documentation; mere attendance is not enough.

Conference presentations and posters at an international conference or symposium can be included in the postgraduate study plan for a maximum number of 6 credits. An oral presentation yields 4 credits and a poster 2 credits, if the student is the primary author and presenter.

International expert assignments may be included in the study plan for a maximum number of 3 credits with the consent of the professor in charge.

Major and minor subjects (10-35 credits) are studies agreed on with the professor in charge, and they may include postgraduate courses in the student's own field, a literature examination in the major subject, and active participation in postgraduate seminars. The scope of the literature examination and the reading list are agreed on with the professor in charge. Postgraduate courses are taught both by departments and by graduate schools within the Faculty.

Field-specific methodology studies (10-35 credits) include studies in scientific research methods relevant to the student's own field of research and research topic, such as statistics, data processing, chemical analysis, econometrics, etc.

The student may include completed studies at other faculties and universities in the studies referred to in Sections I and II. The Faculty recommends that the student pursue at least three months of postgraduate studies at a university or research institute abroad.

The Faculty of Agriculture and Forestry is a member of NOVA, the Nordic Forestry, Veterinary and Agricultural Network, a network of Nordic universities that organizes several field-specific postgraduate courses every year. For information on courses offered by NOVA, see <http://www.nova-university.org/>.

\* \* \*

## **THE DOCTORAL DEGREE**

### **Doctor of Science in Agriculture and Forestry and Doctor of Food Sciences**

A student who has been admitted to pursue scientific postgraduate studies must complete his or her studies in accordance with the postgraduate study plan approved by the Faculty, and write a doctoral dissertation that demonstrates his or her ability for independent and critical thought in the field of research and is approved by the Faculty after a public examination (Standing Regulations of the Faculty of Agriculture and Forestry, Section 26).

### **Doctor of Philosophy**

A person who has completed a higher (i.e. a Master's) degree at a Finnish university or a corresponding degree at a university abroad can be admitted to pursue studies leading to the degree of Doctor of Philosophy at the Faculty of Agriculture and Forestry. In order to complete the doctoral degree, the student must complete at least 60 credits of postgraduate studies in accordance with the study plan, and write a doctoral dissertation that demonstrates his or her ability for independent and critical thought in the field of research and is approved by the Faculty after a public examination. Students who have graduated from the Faculty of Agriculture and Forestry with a Master's degree in either Agriculture and Forestry or Food Sciences may not complete the degree of Doctor of Philosophy.

Changing the major subject after completing a Licentiate degree

If a student who has completed a Licentiate degree in Agriculture and Forestry or Food Sciences wishes to change his or her major subject when pursuing a doctoral degree, or the Faculty has admitted a person with a Licentiate degree in Philosophy to pursue a doctorate in Philosophy, the professor in charge must submit a written statement as to the usefulness of a dissertation in that major subject and the student's eligibility for studies in the new major subject. If necessary, the student must complete supplementary studies in the doctoral major subject.

The format of the dissertation

A doctoral dissertation can be a monograph or it can be in the form of a compilation, or article-based, dissertation, i.e. a collection of several separate scientific articles or manuscripts that have been accepted for publication and all focus on the same topic. An article-based dissertation must always contain a summary. Regardless of its format, the work should meet the scientific criteria set for a doctoral dissertation. The summary of an article-based dissertation should clearly present the theoretical background of the research, its objectives, methods, results, analysis and conclusions.

The separate articles should mainly have been published in refereed scientific journals, and previously unpublished manuscripts should have been refereed and accepted for publication. At least half of the articles included in a compilation dissertation should have been previously published or accepted for publication, and the rest should have been submitted for publication. Compilation dissertations submitted to the Faculty typically contain four separate articles. If an article included in a dissertation has not yet been accepted for publication, the pre-examiners should pay particular attention to the quality of this article in their assessment.

Co-authored publications may be included if the author's independent contribution to them can be verified. If a co-authored publication is included, the doctoral candidate must, when submitting the dissertation, always provide the Faculty with a report on the division of labor in the co-authored article(s) and the candidate's own contribution in particular. The candidate, his or her thesis supervisor, and the other co-authors of the joint publication must verify the report by their signatures. When several candidates wish to include the same co-authored publication in their dissertations, the matter is resolved on a case-by-case basis depending on the reported contribution of each co-author.

The names and posts of the supervisor(s), pre-examiners and opponent of the dissertation must appear on the page following the title page of the completed dissertation.

### **Pre-examination of the dissertation and permission to defend it at a public examination**

Permission to defend a doctoral dissertation is granted by the Faculty Council. For this purpose, the Faculty Council requests and obtains assessments of the dissertation manuscript from at least two experts (pre-examiners), who have the qualifications of a docent or equivalent academic qualifications. When choosing the pre-examiners, particular attention should be paid not only to their expertise but also to their impartiality regarding the topic of the dissertation. The pre-examiners should be chosen from outside the department and mainly from outside the Faculty. A person who has acted as a supervisor of the dissertation or has co-authored any of the articles included in it may not be appointed as pre-examiner. The appointment proposal is made by the professor in charge. The doctoral candidate should confirm in a separate written statement that he or she does not object to the appointment of the nominated pre-examiners. The proposal form is available on the Faculty website. Before the pre-examiners are appointed, the dissertation manuscript should be submitted to the Faculty Office. If the dissertation is made up of separate articles and a summary, the summary and all articles should be submitted; if any one of the articles is co-authored, a report on the division of labor should be included. If the doctoral candidate has not previously completed a Licentiate degree, he or she must also provide the Faculty with an account of what postgraduate studies he or she has completed (see the section on degree requirements above).

After the pre-examiners have been appointed, the department supplies them with all the necessary documents for issuing their statement: the dissertation manuscript or summary; the separate articles included, and, in the case of co-authoring, the report on the candidate's contribution to the co-authored articles. The department must also supply the pre-examiners with instructions on how to examine the manuscript and with an extract of the minutes of the Faculty Council meeting at which they were appointed. The pre-examiners must issue a written statement, either jointly or individually, within three months of accepting the assignment. The statement must explicitly recommend that the candidate either be granted or denied permission to defend his or her dissertation in public. The Faculty has issued separate instructions on how a dissertation is to be pre-examined (Examination and grading of doctoral and Licentiate theses, available on the Faculty website: <http://honeybee.helsinki.fi/opiskelu/jatko-opinnot/engtark.htm>).

If the pre-examiner recommends that permission be denied, the candidate is offered an opportunity to appeal against the statement before the Faculty Council decides whether or not permission is to be granted.

Before a dissertation can be approved it must be printed, and the candidate must defend it at a public examination arranged by the Faculty.

### **Preparing for the public examination**

Upon granting the candidate permission to defend the thesis, the Faculty appoints a Dissertation Grading Committee for the public examination. The members of the committee are: the Opponent (in special cases, two opponents), the pre-examiners and the Custos (chairman) of the public examination. The Custos is a permanent or fixed-term professor of the faculty; the professor in the field of the dissertation is generally appointed Custos. When selecting the Opponent, particular attention should be paid to both academic expertise and impartiality in relation to the work. The Opponent should have the qualifications of a docent or equivalent academic qualifications. He or she should be selected from outside the department and, in general, outside the Faculty. A pre-examiner of the dissertation may not act as opponent. The supervisor of the thesis or any one of the co-authors of an article included in the thesis may not be members of the Dissertation Grading Committee. If the supervisor or co-author of an article is also the professor in charge, he or she may act as Custos, but may not participate in the final grading of the dissertation. The proposal for the composition of the Dissertation Grading Committee is made by the professor in charge. The doctoral candidate should confirm in a separate written statement that he or she does not object to the appointment of the Opponent. Proposal forms are available on the Faculty website. The department is responsible for communicating with the Dissertation Grading Committee.

When the Faculty Council has granted permission to defend the dissertation, the candidate must contact the Opponent and Custos to set a time and place for the examination. The pre-examiners are not required to be present at the examination in order to grade the dissertation. The candidate and his or her department are responsible for the practical arrangements and dissemination of information concerning the public examination. The venue of the examination can be booked through the University's Technical Department. See <http://www.tekn.helsinki.fi/tilavara/Varaajat.html> for more information (in Finnish only).

When the candidate is granted permission to defend the thesis, he or she also receives an information package for doctoral candidates. The package includes forms for disseminating information about the dissertation, application forms for grants to cover printing costs, instructions concerning the printing and distribution of the thesis, information on electronic publication on the University's E-thesis website, and a description of the practices and procedures at the public examination. This information is also available on the Faculty website (see XXX).

The University website has information in English at <http://www.helsinki.fi/tohtoriksi/english/>. The Helsinki University Press website also contains information in English about dissertation publishing (see [www.yliopistopaino.helsinki.fi](http://www.yliopistopaino.helsinki.fi)).

The dissertation must be displayed and available for public viewing on the University's official notice board (on the ground floor of the Main Building) for at least ten days prior to the public examination. The Faculty Dean may, subject to a written application by the doctoral candidate, shorten this time to five days (Section 29 of the university regulations concerning examinations, grading of completed studies and the Board of Examination Appeals at the University of Helsinki). If the applicant wishes to shorten the time of public display, he or she must submit a reasoned, freely formulated application to the Faculty Office (Academic Affairs). It is the responsibility of the candidate to see that the Opponent and Custos receive copies of the dissertation in good time before the examination.

### **Approval and grading of the dissertation**

The Opponent(s) must submit a reasoned written statement on the dissertation to the Faculty Council within six weeks of the public examination. If the Opponent recommends that the dissertation be rejected, he or she must also present the grounds for this recommendation. The Faculty has issued instructions on thesis examination (Examination and grading of doctoral and Licentiate theses). In addition to this, the Dissertation Grading Committee must submit a joint statement proposing a grade for the dissertation. The Custos must submit a statement concerning the doctoral candidate's performance during the public examination. The Custos' statement can also form part of the committee's statement.

The Faculty Council makes the decision concerning approval or rejection and the subsequent grade of the dissertation, based on the statements of the Opponent and the Dissertation Grading Committee. There are three grades: Approved with distinction, Approved, and Rejected. If the proposed grade is Approved with distinction, the committee must be unanimous and present exceptionally strong grounds for the grade. Before the grading of the dissertation, the candidate must be provided with the opportunity to submit an objection to the opponent's statement. Doctoral candidates who wish to object to the grading of their dissertation may appeal in writing to the Board of Examination Appeals within 14 days of the receipt of the grading decision (Section 33 of the regulations concerning examinations, grading of completed studies and the Board of Examination Appeals at the University of Helsinki).

## **THE LICENTIATE DEGREE**

### **The degrees of Licentiate of Agriculture and Forestry and Licentiate of Food Sciences**

A student who has been admitted to pursue scientific postgraduate studies must complete his or her studies in accordance with the postgraduate study plan approved by the Faculty, and write a Licentiate thesis that demonstrates the student's familiarity with the field of research and his or her ability for independent and critical application of scientific research methods (Standing Regulations of the Faculty of Agriculture and Forestry, Section 27).



### **The format of the Licentiate thesis**

A Licentiate thesis can be a monograph, or it can be in the form of a compilation, or article-based thesis, i.e. a collection of several separate scientific articles or manuscripts that have been accepted for publication and all focus on the same topic. An article-based thesis must always contain a summary. Regardless of its format, the work should meet the scientific criteria set for a thesis of this kind. The summary of an article-based thesis should clearly present the theoretical background of the research, its objectives, methods, results, analysis and conclusions.

The separate articles should mainly have been published in refereed scientific journals, and previously unpublished manuscripts should have been refereed and accepted for publication. At least half of the articles included in a compilation thesis should have been previously published or accepted for publication, and the rest should have been submitted for publication. Compilation theses submitted to the Faculty typically contain 2-3 separate articles. An article included in a Licentiate thesis can later be included as a separate article in a doctoral compilation dissertation. Co-authored publications may be included if the author's independent contribution to them can be verified. If a co-authored publication is included, the student must, when submitting the thesis, always provide the Faculty with a report on the division of labor in the co-authored article(s). The student, his or her thesis supervisor, and the other co-authors of the joint publication must verify the report by their signatures. The author of the Licentiate thesis must also provide the Faculty with an account of what postgraduate studies he or she has completed (see the section on degree requirements above).

When several students wish to include the same co-authored publication in their theses, the matter is resolved on a case-by-case basis depending on the reported contribution of each co-author.

The names and posts of the supervisor(s) and examiners must appear on the page following the title page of the completed thesis.

### **Examination of the Licentiate thesis**

The Faculty Council appoints as examiners the professor in charge (in case this professor is unable to act as examiner, another Faculty professor is appointed instead), and at least two other examiners who must at least hold a doctorate. A person who has acted as supervisor of the thesis or has co-authored any of the articles included in it may not be appointed as examiner. The appointment proposal is made by the professor in charge. The proposal form is available on the Faculty website. Before the examiners are appointed, the thesis manuscript should be submitted to the Faculty Office. If the thesis is made up of separate articles and a summary, the summary and all articles should be submitted; if any one of the articles is co-authored, a report on the division of labor should be included.

After the examiners have been appointed, the department supplies them with a bound copy of the thesis. If the thesis consists of separate articles, the examiners should be provided with both the articles and the summary, and, in the case of co-authoring, the report on the candidate's contribution to the co-authored articles. The department must also supply the examiners with instructions on how to examine the manuscript and with an extract of the minutes of the Faculty Council meeting at which they were appointed. The department is responsible for communicating with the examiners.

### **Approval and grading of the Licentiate thesis**

Before the Licentiate thesis can be approved and graded, the student must present his or her research at a Licentiate seminar, during which the examiners and other interested parties will present their commentaries. After this, the examiners will write their statement.

The examiners of the Licentiate thesis must issue a written statement, either jointly or individually, within two months of accepting the assignment. The statement must explicitly recommend the thesis either be approved or rejected, and the subsequent grade. The Faculty has issued separate instructions on how a thesis is to be examined (Examination and grading of doctoral and Licentiate theses, available on the Faculty website: <http://mm.helsinki.fi/opiskelu/jatko-opinnot/engtark.htm>).

The Faculty Council makes the decision concerning approval or rejection and the subsequent grade of the thesis on the basis of the examiners' statement. There are three grades: Approved with distinction, Approved, and Rejected. Before the grading of the thesis, the student must be offered an opportunity to submit an objection to the examiners' statement. Students who wish to object to the grading of their Licentiate thesis may appeal in writing to the Board of Examination Appeals within 14 days of the receipt of the grading decision (Section 33 of the regulations concerning examinations, grading of completed studies and the Board of Examination Appeals at the University of Helsinki).

The Faculty Council's role in the proceedings

The Faculty Council is responsible for appointing examiners for Licentiate theses and pre-examiners for doctoral dissertations; for granting permission to defend dissertations; and, for grading and approving Licentiate and doctoral theses. Licentiate theses are discussed at two separate Faculty Council meetings and doctoral dissertations at three meetings before arriving at a final decision. In order to have his or her thesis taken up for discussion at a Faculty Council meeting, the student must have been accepted for postgraduate studies at the Faculty of Agriculture and Forestry and he or she must be registered as attending in the student register. The Faculty Council convenes once a month except during the summer months. The meeting timetable can be found on the Faculty website at <http://www.helsinki.fi/mmttk/tiedekunta/kokousaikataulu.htm> (in Finnish) or at <http://www.mm.helsinki.fi/ENGLISH/admin.htm> (in English). The material for the meeting must be given to the presenting official at the Faculty Office not later than on Tuesday of the week preceding the meeting.

### **The Licentiate or Doctoral diploma**

In order to be awarded the degree of Licentiate or Doctor, the student must be registered as attending in the Student Register and he or she must have been admitted to pursue postgraduate studies at the Faculty of Agriculture and Forestry. After the Licentiate thesis or doctoral dissertation has been approved and graded, the Faculty will issue a postgraduate degree diploma. The student does not automatically receive a diploma; it will be issued upon a written application to the Faculty Office administration.

The diploma can be applied for when

- the student has completed all the required postgraduate studies (checked and confirmed by the signature of the professor in charge); and,
- the Faculty Council has approved and graded the Licentiate thesis or doctoral dissertation.

The Faculty Office administration (Viikki Infocentre, 3rd floor, Viikinkaari 11) is responsible for issuing diplomas. The student should fill in a form for requesting the diploma. This form will be mailed to the student upon the approval of his or her thesis, and can also be printed from the Faculty website. The form contains additional information on obtaining the degree diploma.

### **Entry into force**

These guidelines are in effect as of 8 September 2005. Students who have begun postgraduate studies before 1 August 2005 have the right to transfer to the new degree system and complete their degree in accordance with the Government Decree on University Degrees (794/2004) and the Standing Regulations that entered into force on 1 August 2005. The student must notify the Faculty of the transfer in writing. The transfer is binding and cannot be reversed. If the student has not completed his or her degree by 31 July 2008, he or she must transfer to the new degree system and pursue his or her studies in accordance with the new Decree and Standing Regulations.

Students who have begun postgraduate studies before 1 August 2005, but whose postgraduate study plan has not yet been approved when these guidelines take effect, must draw up their postgraduate study plan according to the principles presented above.

### The approval process of a dissertation at the Faculty

The candidate submits to the Academic Affairs Office

- the dissertation manuscript
- information on completed postgraduate studies
- report on division of labor in co-authored articles

Two pre-examiners are proposed by the professor

Student may submit objection to the appointed pre-examiners

**FACULTY COUNCIL**  
- appoints pre-examiners

(Minutes given to student and professor)

The department/student provides pre-examiners with

- dissertation manuscript
- minutes
- report on division of labor in co-authored articles
- instructions for examining the dissertation

Pre-examiners' statements to Faculty (copies to student)

Professor proposes composition of Dissertation Grading Committee (Opponent, Custos, pre-examiners)

Student may submit objection to Opponent

**FACULTY COUNCIL**  
Grants permission to defend dissertation; appoints Dissertation Grading Committee

Student receives doctoral candidates' information package

Minutes given to student and professor

#### PUBLIC EXAMINATION

Opponent's, Dissertation Grading Committee's, and Custos' statements submitted to Faculty (student receives copies)

**FACULTY COUNCIL**  
Decision on approval and grading of dissertation

Minutes to student  
Application for postgraduate diploma

### The approval process of a Licentiate thesis at the Faculty

The candidate submits to the Academic Affairs Office

- the thesis manuscript
- information on completed postgraduate studies
- report on division of labor in co-authored articles

Three examiners are proposed by the professor

**FACULTY COUNCIL**  
- appoints examiners

(Minutes given to student and professor)

The department/student provides examiners with

- thesis manuscript
- minutes
- report on division of labor in co-authored articles
- instructions for examining the thesis

#### LICENTIATE SEMINAR

Examiners' statements submitted to Faculty (student receives copies)

**FACULTY COUNCIL**  
Decision on approval and grading of thesis

Minutes to student  
Application for postgraduate diploma

# Government Decree on University Degrees 794/2004

## Chapter 1 General provisions

### Section 1 Application

1. This Decree provides for lower and higher university degrees and scientific and artistic postgraduate degrees referred to in the Universities Act (645/1997). Professional postgraduate degrees awarded by universities come under separate statutes.

### Section 2 Fields of education and responsibilities for provision of degree education

1. Attached to this Decree is a list of fields of education, degree names and universities which award the degrees.

### Section 3 Provision of education leading to lower and higher university degrees

1. Education leading to lower and higher university degrees may be based on subjects or in the form of degree programmes. Education leading to a higher university degree built on a lower university degree or education of a corresponding level may also be arranged as a degree programme to which there is a separate selection.
2. Education leading to a higher education degree may also be arranged in international cooperation.

### Section 4 Degrees taken in foreign languages

1. A university degree referred to in Section 9(3) of the Universities Act which has been taught and studied in a language other than Finnish or Swedish shall be given an English degree title in addition to the Finnish or Swedish title enumerated in the attached list.

### Section 5 Extent of studies

1. The measure for the extent of studies shall be a credit. Courses shall be quantified according to the work load required. The average input of 1600 working hours needed for studies of one academic year shall correspond to 60 credits.

### Section 6 Language proficiency

1. The student must demonstrate in studies included in education for a lower or higher university degree or otherwise that he/she has attained:
  - (1) proficiency in Finnish and Swedish which is required of civil servants in bilingual public agencies and organisations under Section 6(1) of the Act on the Knowledge of Languages Required of Personnel in Public Bodies (424/2003) and which is necessary for their field; and
  - (2) skills in at least one foreign language needed to follow developments in the field and to operate in an international environment.
2. The provisions of subsection 1 do not concern a student who has been educated in a language other than Finnish or Swedish or a student who has been educated abroad. The language proficiency of such students shall be determined by the university.
3. For special reasons, the university may either totally or partially exempt a student from the requisite language skills referred to in subsection 1.

## Chapter 2 Lower university degree

### Section 7 Aims of the lower university degree

1. Studies leading to a lower university degree shall provide the student with:
  - (1) knowledge of the fundamentals of the major and minor subjects or corresponding study entities or studies included in the degree programme and the prerequisites for following developments in the field;
  - (2) knowledge and skills needed for scientific thinking and the use of scientific methods or knowledge and skills needed for artistic work;

- (3) knowledge and skills needed for studies leading to a higher university degree and for continuous learning;
  - (4) a capacity for applying the acquired knowledge and skills to work; and
  - (5) adequate language and communication skills.
2. The education shall be based on research or artistic activity and professional practices.

#### **Section 8 Extent of studies required for a lower university degree**

1. Studies required for a lower university degree shall be 180 credits, unless otherwise provided below. The university must arrange the education to enable the student to complete the degree in three years of full-time study.
2. The extent of studies required for the degree of Bachelor of Fine Arts shall be 210 credits. The university must arrange the education to enable the student to complete the degree in three and a half years of full-time study.

#### **Section 9 Structure of the lower university degree**

1. Studies leading to a lower university degree may include:
  - (1) basic and intermediate studies;
  - (2) language and communication studies;
  - (3) interdisciplinary programmes;
  - (4) other studies; and
  - (5) work practice for professional development.
2. The degree of Bachelor of Science in Pharmacy shall include a compulsory internship.
3. The extent of basic studies in the subject or a corresponding entity shall be a minimum of 25 credits. The extent of intermediate studies in the subject or a corresponding entity shall be a minimum of 60 credits. The intermediate studies in the major subject or a corresponding entity shall include a thesis of at least six and at most ten credits.

#### **Section 10 Requisite components of the lower university degree**

1. To be awarded a lower university degree, the student must complete basic and intermediate studies in the major subject or a corresponding entity and language, and communication studies.
2. The student must demonstrate that he/she has attained the objectives set for the degree, studies and thesis and the language proficiency referred to in Section 6. The student must write a maturity essay which demonstrates conversance with the topic of the thesis and skills in the use of Finnish or Swedish.
3. When a student is not required to have language proficiency referred to in Section 6(1), the university shall determine separately the language used in the maturity essay.

#### **Section 11 Specialisation based on certain lower university degrees**

1. Students holding the degree of Bachelor of Science in Pharmacy or an equivalent degree may study for a pharmaceutical specialisation. Specialisation studies in pharmacy comprise in-depth studies in the speciality, research on the speciality and guided work practice in the speciality. The aim of specialisation is good knowledge of the speciality and an ability to work independently in the speciality field.

### **Chapter 3 Higher university degree**

#### **Section 12 Aims of the higher university degree**

1. The education shall provide the student with:
  - (1) good overall knowledge of the major subject or a corresponding entity and conversance with the fundamentals of the minor subject or good knowledge of the advanced studies included in the degree programme;
  - (2) knowledge and skills needed to apply scientific knowledge and scientific methods or knowledge and skills needed for independent and demanding artistic work;
  - (3) knowledge and skills needed for independently operating as an expert and developer of the field;

- (4) knowledge and skills needed for scientific or artistic postgraduate education; and
- (5) good language and communication skills.
- 2. The education shall be based on scientific research or artistic activity and professional practices in the field.

#### **Section 13 Extent of studies leading to a higher university degree**

1. The extent of studies leading to a higher university degree shall be 120 credits, unless otherwise provided in this Section or in Section 14 below. The university must arrange the education to enable the student to complete the degree in two years of full-time studies.
2. The extent of studies required for a programme leading to the higher university degree which is geared to foreign students shall be a minimum of 90 credits. The university must arrange the education so as to enable a student studying full time to complete the degree in a time corresponding to its extent, nonetheless in no more than two academic years.
3. The extent of studies required for the degree of Master of Science in Psychology and the degree of Master of Art in Music shall be 150 credits. The university must arrange the education so as to enable the student to complete the degree in two and a half years of full-time study.
4. The extent of studies required for the degree of Licentiate of Veterinary Medicine and the degree of Licentiate of Medicine shall be 180 credits. The university must arrange the education so as to enable the student to complete the degree in three years of full-time study.

#### **Section 14 Arrangement and extent of education leading to the higher university degree which does not include the relevant lower university degree**

1. In the fields of medicine and dentistry the university may arrange the education leading to the higher university degree without including a lower university degree in the education.
2. The extent of studies required for the degree of Licentiate of Medicine shall be 360 if the university organises the education leading to the higher university degree so that it does not include a lower degree. The university must arrange the education so as to enable the student to complete the degree in six years of full-time study.
3. The extent of studies required for the degree of Licentiate of Dentistry shall be 300 if the university organises the education leading to the higher university degree so that it does not include a lower degree. The university must arrange the education so as to enable the student to complete the degree in five years of full-time study.

#### **Section 15 Structure of the higher university degree**

1. The studies leading to the higher university degree may include:
  - (1) basic and intermediate studies and advanced studies;
  - (2) language and communication studies;
  - (3) interdisciplinary study programmes;
  - (4) other studies; and
  - (5) internship improving expertise.
2. Studies for the degrees of Licentiate of Medicine, Licentiate of Dentistry and Licentiate of Veterinary Medicine, the degree of Master of Science in Pharmacy and the degree of Master of Science in Psychology, and education in social work belonging to the field of social sciences include compulsory internships.
3. Basic studies and intermediate studies shall have the minimum extents referred to in Section 9(2). The extent of advanced studies shall be a minimum of 60 credits. The major subject or a corresponding entity included in the degree or the advanced studies of a degree programme shall include a thesis of at least 20 and at most 40 credits.

#### **Section 16 Requisite components of the higher university degree**

1. To be awarded a degree, the student must complete advanced studies in the major subject or a corresponding entity or the advanced studies of a degree programme and the internship supervised by the university possibly included in the degree. The student must also complete sufficient studies in minor subject(s), unless these have been completed in education leading to a lower university degree.
2. The student must demonstrate that he/she has attained the objectives set for the degree, studies and thesis and the language proficiency referred to in Section 6. The student must write a maturity essay which shows command of the topic of the thesis and of the Finnish or Swedish language.

3. The student need not demonstrate command of the Finnish or Swedish language in the maturity essay included in the higher university degree if he/she has demonstrated his/her command of the language in a maturity essay included in a lower university degree studied in same language.
4. When a student is not required to have the language proficiency referred to in Section 6(1), the university shall determine separately the language of the maturity essay.

#### **Section 17 Adherence to the statutes of the European communities**

1. The provision of education leading to the degrees of Licentiate of Veterinary Medicine, Licentiate of Medicine and Licentiate of Dentistry, the degree of Master of Science in Pharmacy and the degree of Master of Science in Architecture, and the education leading to a lower university degree on which they are based must comply with the following statutes of the European Communities concerning the minimum level of education:
  - (1) Council Directive 78/687/EEC concerning the coordination of provisions laid down by law, regulation or administrative action in respect of the activities of dental practitioners
  - (2) Council Directive 78/1027/EEC concerning the co-ordination of provisions in respect of the activities of veterinary surgeons
  - (3) Council Directive 85/384/EEC of 10 June 1985 on the mutual recognition of diplomas, certificates and other evidence of formal qualifications in architecture, including measures to facilitate the effective exercise of the right of establishment and freedom to provide services
  - (4) Council Directive 85/432/EEC concerning the coordination of provisions laid down by Law, Regulation or Administrative Action in respect of certain activities in the field of pharmacy, and
  - (5) Council Directive 93/16/EEC of 5 April 1993 to facilitate the free movement of doctors and the mutual recognition of their diplomas, certificates and other evidence of formal qualifications

### **Chapter 4** **Provisions concerning teacher education**

#### **Section 18 Objective of teacher education**

1. A special aim in teacher education provided by universities is to equip the student with knowledge and skills for independent work as a teacher, a counsellor and an educator.

#### **Section 19 Studies in teacher education**

1. The studies included in teacher education shall be
  - (1) studies providing professional competence for posts in early education and for pre-primary education;
  - (2) multidisciplinary studies in the subjects and cross-curricular themes taught in basic education which provide professional competence for the teaching of the core subjects included in the basic education core curriculum under Section 11 of the Basic Education Act (628/1998);
  - (3) studies providing professional competence for special-needs education;
  - (4) studies providing professional competence for guidance counselling;
  - (5) teachers' pedagogical studies, which are didactically oriented studies in education science comprising guided teaching practice and in which the student can specialise in basic education, upper secondary education, vocational education and training or adult education; and,
  - (6) in subject teacher education, studies in the teaching subject, which are studies promoting the command of a subject included in basic education, upper secondary education or other education.
2. Studies referred to in paragraphs 1-5 of subsection 1 above shall be studies of a minimum of 60 credits in extent which are provided by the universities with responsibility for the field of education science. The teaching practice referred to in paragraph 5 of the said subsection shall be carried out in a university practice school, other educational institution approved by the university or in some other manner approved by the university.
3. The studies in the teaching subject referred to in paragraph 6 of subsection 1 above shall be basic, intermediate and advanced studies in the major subject or a corresponding entity included in the higher university degree and basic and intermediate studies in another subject or in a corresponding entity.

## **Section 20 Structure of teacher education**

1. Education leading to the degree of Master of Science in Education may include class teacher education, special-needs teacher education and guidance counsellor education referred to in Section 19(1). Some of these studies may be completed in education leading to the degree of Bachelor of Science in Education, which forms the basis for the Master's degree. Education leading to the degree of Bachelor of Science in Education may include kindergarten teacher education.
2. Kindergarten teacher education shall include studies preparing for posts in early education and for pre-primary education referred to in Section 19(1), class-teacher education shall include interdisciplinary studies in the teaching subjects and cross-curricular themes, special-needs teacher education shall include studies providing professional competence for special-needs education, and guidance counsellor education shall include studies providing professional competence for guidance counselling. Teachers' pedagogical studies referred to in the same subsection shall be incorporated in all the teacher education listed above, with the exception of kindergarten teacher education.
3. The teacher education studies referred to in subsection 2 above may also be incorporated into other applicable lower and higher university degrees or they may also be taken as non-degree studies after graduation.
4. Education leading to the higher university degree may include subject teacher education, which comprises studies in one or two teaching subjects referred to in Section 19(1), and teachers' pedagogical studies. The studies may be taken either as part of a degree or as non-degree studies. Some studies included in subject teacher education may be taken in education leading to the lower university degree, on which the higher university degree is based.

## **Chapter 5**

### **Scientific and artistic postgraduate education**

## **Section 21 Objectives of scientific and artistic postgraduate education**

1. The aim of postgraduate education is that the student:
  - (1) becomes well-versed in his/her own field of research and its social significance and gains knowledge and skills needed to apply scientific research methods independently and critically and to produce new scientific knowledge within his/her field of research;
  - (2) becomes conversant with the development, basic problems and research methods of his/her own field of research; and
  - (3) gains such knowledge of the general theory of science and of other disciplines relating to his/her own field of research as enables him/her to follow developments in them.
2. In the field of art and design, the aim of postgraduate education may be, in addition to the aims listed in subsection 1, that the student gains knowledge and skills for independently conceiving methods of artistic creation or creating products, objects or works which fulfil high artistic demands.
3. In the fields of fine arts, music, and theatre and dance, the aim of postgraduate education may, in addition to or instead of the aims referred to in subsection 1, that the student gains knowledge and skills for independently conceiving methods of artistic creation or products or transactions which fulfil high artistic demands.

## **Section 22 Requisite components of the doctorate degree**

1. To be awarded a doctorate, the student must:
  - (1) complete the required postgraduate studies;
  - (2) demonstrate independent and critical thinking in the field of research; and
  - (3) write a doctoral dissertation and defend it in public.
2. In the fields of fine arts, music, art and design, and theatre and dance, a student admitted to postgraduate education may demonstrate in public the knowledge and skills required by the university.
3. As a doctoral dissertation may also be approved a number of scientific publications or manuscripts vetted for publication deemed sufficient by the university which deal with the same set of problems and a paper summarising the findings or some other work which meets corresponding scientific criteria. The



publications may include co-authored publications if the author's independent contribution to them can be demonstrated.

#### **Section 23 Requisite components of the licentiate degree**

1. A student admitted to postgraduate education may be awarded the licentiate degree when he/she has completed the part of the postgraduate studies assigned by the university and the specialisation education possibly included in the degree.
2. The licentiate degree shall include a licentiate thesis, in which the student demonstrates good conversance with the field of research and the capability of independently and critically applying scientific research methods.
3. In the field of music and in the field of theatre and dance, the licentiate degree may include a public demonstration of knowledge and skills, instead a licentiate thesis.
4. As a licentiate thesis may also be approved a number of scientific publications or manuscripts vetted for publication deemed sufficient by the university which deal with the same set of problems and a paper summarising the findings or some other work which meets corresponding scientific criteria. The publications may include co-authored publications if the author's independent contribution to them can be demonstrated.

#### **Section 24 Specialisation included in the licentiate degree**

1. A licentiate degree completed in postgraduate education may also include specialisation. In this case the education includes systematic theoretical and practical familiarisation with the speciality, a licentiate thesis on the speciality and guided work practice in the field of specialisation. The aim of the specialisation included in the licentiate degree is that the student becomes conversant with the speciality and acquires an ability to work independently in his/her own field of specialisation.

### **Chapter 6 Miscellaneous provisions**

#### **Section 25 Credit transfer**

1. In degree studies the student may count studies completed in a Finnish or foreign university or some other educational institution towards the degree and replace studies included in the degree with other studies of a corresponding level, as specified by the university. At the discretion of the university, the student may also count towards the degree and replace studies included in the degree with knowledge demonstrated in some other manner.

#### **Section 26 Diplomas**

1. The university shall issue to the student a diploma on the completion of a lower or higher university degree completed, which must indicate:
  - (1) the name of the degree and the field of education;
  - (2) the major subject or a corresponding entity or the degree programme;
  - (3) possible specialisation included in the degree and the speciality;
  - (4) the main content of the degree; and
  - (5) the language proficiency demonstrated by the student; the recording of the language proficiency shall take account of Section 19 of the Government Decree on the Demonstration of Proficiency in the Finnish and Swedish Languages in Civil Service (481/2003).
2. The diploma for a postgraduate university degree shall come under the provisions of subsection (1)-(4).
3. On the student's request, the university shall issue a certificate of completed studies while the student still studying.
4. The university shall issue a Diploma Supplement intended for international use to a person who

has completed a degree or studies at the university. The Diploma Supplement shall provide sufficient information about the university and about the studies or study attainments recorded in the diploma or certificate, and about their level and status in the education system.

5. A university in which it is possible to complete a study attainment included in the teacher education referred to in Section 19 may upon request issue a certificate indicating that the student has demonstrated that he/she has acquired knowledge and skills equivalent to the study attainment in a manner other than the studies specified in the statutory competence requirements. Where needed, the university may make the issuing of the certificate conditional on the applicant's completing supplementary studies.

#### **Section 27 Graduate professional titles**

1. The university may entitle:

- (1) a person with the degree of Master of Science in Economics and Business Administration to use the title of ekonomisti;
- (2) a person with the degree of Master of Science in Agriculture and Forestry to use the title of agronomi or metsänhoitaja;
- (3) person with a Diploma in Fine Arts awarded under the repealed Decree concerning the Lower and Higher University Degree in Fine Arts (367/1993) to use the title of kuvataiteen kandidaatti and a person with a Degree in Fine Arts awarded under the said Decree to use the title of kuvataiteen maisteri; and
- (4) a person who has been awarded a higher university degree called kandidaatti to use the title of maisteri.

#### **Section 28 Development of education and degrees**

1. The university shall have the duty constantly to evaluate and develop degrees, degree studies and teaching. Attention shall be especially paid to the quality of degrees, instruction, guidance counselling and studies, to educational needs in society, to the national and international equivalence of degrees and studies, and to the effectiveness of education.

### **Chapter 7**

#### **Coming into force and transitional provisions**

#### **Section 29 Coming into force**

1. This Decree will come into force on the first of August 2005.
2. This Decree shall repeal the following Decrees with subsequent amendments:
  - (1) Decree concerning Degrees in Veterinary Medicine (298/1978) issued on the 21st of April 1978;
  - (2) Decree concerning Degrees in Pharmacy (246/1994) issued on the 30th of March 1994;
  - (3) Decree concerning the Degree of Doctor of Philosophy (1279/1991) issued on the 25th of October 1991;
  - (4) Decree concerning Degrees in Dentistry (290/1976) issued on the 26th of March 1976;
  - (5) Decree concerning Degrees in the Humanities and the Natural Sciences (221/1994) issued on the 18th of March 1994;
  - (6) Decree concerning Degrees in Educational Science and Teacher Education (576/1995) issued on the 21 of April 1995;
  - (7) Decree concerning Degrees in Economics and Business Administration (139/1995) issued on the 31st of January 1995;
  - (8) Decree concerning Degrees Awarded by the Academy of Fine Arts (381/1997) issued on the 25th of April 1997;
  - (9) Decree concerning Degrees in Sport and Health Sciences (327/1994) issued on the 22nd of April 1994;
  - (10) Decree concerning Degrees in Medicine (762/1975) issued on the 26th of September 1975;
  - (11) Decree concerning Degrees in Agriculture and Forestry (214/1995) issued on the 17th of February 1995;
  - (12) Decree concerning Degrees in Law (86/1996) issued on the 12th of February 1996;

- 13) Decree concerning Degrees in Psychology (318/1996) issued on the 3rd of May 1996;
- 14) Decree concerning Degrees awarded by Sibelius Academy (148/1995) issued on the 3rd of February 1995;
- 15) Decree concerning University Degrees in Art and Design (440/1994) issued on the 3rd of June 1994;
- 16) Decree concerning University Degrees in Theatre and Dance (216/1995) issued on the 17th of February 1995;
- 17) Decree concerning Degrees in Technology (215/1995) issued on the 17th of February 1995;
- 18) Decree concerning Degrees in Theology (517/1995) issued on the 7th of April 1995;
- 19) Decree concerning Degrees in Health Sciences (628/1997) issued on the 19th of June 1997; and
- 20) Decree concerning Degrees in Social Sciences (245/1994) issued on the 30th of March 1994.

3. Nonetheless, the following Sections of the Decrees listed in subsection 1 shall continue to apply:

- (1) Section 5 and Section 14a of the Decree concerning Degrees in Pharmacy;
- (2) the Appendix to and Section 14 a of the Decree concerning Degrees in the Humanities and the Natural Sciences;
- (3) the Appendix to the Decree concerning Degrees in Educational Science and Teacher Education;
- (4) Section 3 of the Decree concerning Degrees Awarded by the Academy of Fine Arts;
- (5) Section 14 of the Decree concerning Degrees in Psychology;
- (6) Section 3 of the Decree concerning Degrees awarded by Sibelius Academy;
- (7) Sections 5 and 6 of the Decree concerning University Degrees in Art and Design;
- (8) Section 5 of the Decree concerning Degrees in Technology;
- (9) Section 10 of the Decree concerning Degrees in Health Sciences;
- (10) Section 4a as concerns educational responsibilities in social work and Section 14 a of the Decree concerning Degrees in Social Sciences.

### **Section 30 Status of students**

- 1. A student who is studying for a degree under a Decree repealed under Section 29 when this Decree comes into force shall have the right under Section 20 of the Act Amending the Universities Act (715/2004) to transfer to studies governed by this Decree or to continue studying under the repealed Decree.
- 2. The student may count studies completed under the repealed Decree towards a degree governed by this Decree, as specified by the university.

### **Section 31 Transitional provision concerning degree names in law**

- 1. The provisions in Acts or other statutes concerning the degree of Candidate of Laws shall also concern Master of Laws after this Decree comes into force.

### **Section 32 The title of Candidate of Medicine and Candidate of Dentistry**

- 1. A student in medicine may still be awarded the title of Candidate of Medicine referred to in Section 17(3) of the Decree concerning Degrees in Medicine, provided that all the universities which have been assigned responsibility for medical education arrange education leading to the degree of Licentiate of Medicine without the intermediate lower degree included in the education.
- 2. A student in dentistry may still be awarded the title of Candidate of Medicine referred to in Section 17(4) of the Decree concerning Degrees in Dentistry, provided that all the universities which have been assigned responsibility for dentistry education arrange education leading to the degree of Licentiate of Dentistry without the intermediate lower degree included in the education.