

Open - access courses for exchange and visiting students

Dept. of Agricultural Sciences, Univ. of Helsinki

The following courses are open for **all exchange and visiting students at the Department of Agricultural Sciences, University of Helsinki**. Please note, however, that **these are advanced level courses (MSc level)** and, hence, they all have **certain prerequisites**, i.e. your previous studies (BSc level) need to provide a good foundation for successful completion of the courses. Please click the links on the left side to see the prerequisites of each course.

Please note that the latest information about the courses is found in [WebOodi](#). You can browse WebOodi without logging into the system, but you need to log in when you want to register for courses.

Autumn term, periods I-II

		ECTS credits	Period	Arranged in odd or even years
GENERAL COURSES (No specific prerequisites needed)				
KTB410	Introduction to Studies in Plant Production Sciences (no PSP)	2	I	
KTB501	Seminars in Plant Production Sciences (participation only)	1	I-IV	
ADVANCED LEVEL COURSES (Please note the prerequisites of each course)				
Agroecology				
AEKO505	Wildlife in the Farming Environment (max. quota 25 students)	5	I	
AEKO403	Agroecosystem and Agrobiodiversity (max. quota 30 students)	5	II	even
AEKO501	Sustainability in Agri-Food Systems	5	II	odd
AEKO502	Literature in Agroecology	10	open	
Crop Science				
KTB403	Stress Physiology	3	II	
KVIL302	World Crops	5	II	even
KVIL402	Advanced Training in a Research Group	5-10	open	
KVIL403	Book Summary	3	open	
Horticulture				
PTARH303	Postharvest Physiology and Technology	5	II	odd
PTARH502	Literature in Horticulture	5	open	
Plant Breeding				
JAL403	Molecular Methods in Applied Plant Genetics	5	I	even
JAL504	Breeding of Agricultural and Horticultural Plants	5	I	odd
JAL505	Forest Tree Breeding	5	I	even
JAL502	Literature in Plant Breeding	10	open	
Plant Pathology				
KPAT401	Epidemiology and Ecology of Plant Pathogens (lectures only)	2	I	even
KPAT404	Plant Virology (lectures only)	2	II	even
KPAT405	Plant Pathogenic Bacteria (lectures only)	2	II	odd
KPAT502	Literature in Plant Pathology	5	open	
Agricultural Zoology				
MAEL403	Integrated Plant Protection	5	II	odd
MAEL502	Literature in Agricultural Zoology	5	open	
Environmental Engineering in Agriculture				
AGTEK450	Environmental Technology of Crop Production	7,5-15	II	odd
AGTEK460	Environmental Technology of Animal Production	5-15	II	even

Spring term, periods III-IV

		ECTS credits	Period	Arranged in odd or even years
GENERAL COURSES (No specific prerequisites needed)				
812092	Bioethics and Legislation	3	IV	
KTB501	Seminars in Plant Production Sciences (participation only)	1	I-IV	
ADVANCED LEVEL COURSES (Please note the prerequisites of each course)				
Agroecology				
AEKO502	Literature in Agroecology	10	open	
Crop Science				
KTB401	Crop Physiology	3	III	
KVIL303	Field Crop Quality	3	IV	
KVIL402	Advanced Training in a Research Group	5-10	open	
KVIL403	Book Summary	3	open	
Horticulture				
KBLOT300	Plant Biotechnology and Molecular Biology	5	III	
KTB401	Crop Physiology	3	III	
PTARH402	Photobiology	5	IV	odd
PTARH403	Horticulture for Human Well-being	5	IV	odd
PTARH502	Literature in Horticulture	5	open	
Plant Breeding				
KBLOT300	Plant Biotechnology and Molecular Biology	5	III	
JAL401	Selection Breeding and Experimental Design	5	III	even
JAL402	Conservation of Plant Genetic Resources	5	IV	even
JAL502	Literature in Plant Breeding	10	open	
Plant Pathology				
KPAT502	Literature in Plant Pathology	5	open	
Agricultural Zoology				
MAEL402	Biological Control of Insects, Pests and Weeds	3	IV	odd
MAEL502	Literature in Agricultural Zoology	5	open	
Animal Breeding				
KEJAL450	Estimation of Variance Components	5	IV	odd
KEJAL470	Genomic Selection	3	IV	

Course descriptions in WebOodi, Autumn periods I-II

General

812089 Introduction to studies in plant production biology (KTB410), 3 cr

Target group	Master's degree, visiting and exchange students in plant production sciences, biotechnology and related disciplines.
Timing	Autumn term, period I
Preceding studies	Basic knowledge in plant production sciences, biotechnology or related disciplines.
Objective	The student will get to know the department, its programmes, its personnel, its premises, and its working style. The student will learn how to obtain and cite literature, and to avoid plagiarism and misconduct. The student will prepare a personal study plan (PSP) for completing the Master's degree programme (MSc students only).
Contents	Introductory lectures to the specializations of the department. Guided tours in the premises. Finding and using scientific literature, and preparation of a correct reference list. Good scientific conduct. Group presentation of an interview with a professor. Planning the studies included in the Master's degree programme, and the plan has to be approved by the professor (MSc students only).
Study materials and literature	Divan, A. Communication skills for the biosciences, a graduate guide. Oxford, UK: Oxford University Press. 270 pp (This book is also used for KTB402, Scientific Writing). A home language to English dictionary, and an English dictionary
Completion	Lectures and guided tours (attendance 85%), group work and independent study
Evaluation	Reference list 20%, oral presentation of group work 80%. Scale 0 - 5
Responsible person	Frederick Stoddard and Viola Niklander-Teeri
Relations to other study units	993734 Academic Writing I. Supplementary studies for MScPPS students (textbook review and basic lab course).
Other information	1 credit of personal study plan (PSP) is integrated in the course. Visiting or exchange students get 2 credits from the course (no PSP).

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812147 Seminars in plant production biology (KTB501), 3 cr

Target group	Master's degree, visiting and exchange students in plant production sciences, biotechnology and related disciplines.
Timing	Seminar presentations on Tuesdays at 14-16, both autumn and spring term.
Preceding studies	Basic knowledge in plant production sciences, biotechnology or related disciplines.
Objective	To familiarize students with current research problems in plant production science. To present scientific results (MSc students only).
Contents	Presentation of the results and conclusions of your own MSc thesis (MSc students only). There will be a monthly seminar from a member of scientific staff of the Department of Agricultural Sciences.
Completion	Participation in eight MSc seminars. Presentation of own results in a seminar and writing an abstract of the results, acting as an opponent to one seminar (MSc students only).
Evaluation	Pass/Fail
Responsible person	Paula Elomaa
Relations to other study units	MSc thesis (MSc students only)
Other information	1 credit of information and communication technology studies (ICT) is integrated in the course. Visiting or exchange students get 1 credits from the course (participation in eight seminar days only). More information: https://wiki.helsinki.fi/display/KTB501seminarit/Seminaariajat Seminar times

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Agroecology

812096 Wildlife in the Farming Environment (AEKO505), 5 cr

Target group	Master's degree, visiting and exchange students in agroecology and related disciplines.
Timing	Autumn term, period I
Preceding studies	Basic knowledge of ecological concepts and principles.
Objective	After completing the course the successful student will have sound understanding of associated (non-productive) biodiversity in agricultural ecosystems, its interaction with the farming practices, and of the basic principles and approaches of conservation in agroecosystems. On a practical level, the student will gain skills to apply conservation planning in real farm conditions.
Contents	The specific focus is on non-productive biodiversity, and we will proceed all the way from measuring it in field to the on-farm planning. With assistance of experts in fields of research, advisory and nature management, we will explore the variety of biodiversity of a farm, effects of farming practices, and basic principles and motivations for nature conservation; learn of major legal and other conservation tools in the EU relevant to a farmer; go through the process of management planning and search for available advisory information. The course will culminate in developing a management plan for a real farm.
Study materials and literature	Will be provided during the course.
Completion	Lectures or alternative assignments, two brief essays related to own country, individual exercise, group presentation, and a course report. Contact the teacher about a 2-op option tailored to your background.
Evaluation	Based on the assignments as above. Graded 0-5.
Responsible person	Juha Helenius
Other information	For a maximum of 25 students. If this quota is exceeded, priority will be given to students with a good track record from previous studies in (agro)ecology.
Realisation and working methods	Interactive lectures, weekly work in field, a study visit, individual and group work, and a final seminar.

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812017 The Agroecosystem and agrobiodiversity (AEKO403), 5 cr

Target group	Master's degree, visiting and exchange students in agroecology and related disciplines.
Timing	Autumn term, period II, in even years
Preceding studies	Basic knowledge of ecological concepts and principles
Objective	After attending this course, the successful student will understand ecological processes in an agricultural setting. He or she will also be able to explain how populations and communities in the cultivated parts of the landscape interact with those of surrounding habitats, and how landscape structure affects both the abundance of individual species and the interaction among species.
Contents	During the course, we will explore the key role of agricultural habitats in sustaining biodiversity at several hierarchical levels; the effects of landscape structure on processes at the level of populations and communities; links between the cultivated and surrounding areas; the concepts of ecosystem functioning and ecosystem services, as well as the connection between diversity and functioning.
Study materials and literature	Will be provided during the course.
Completion	Lectures, essays and exercises. The students should reserve substantial time beyond actual lectures for completing additional exercises.
Evaluation	Based on an exam, assignments and a learning diary. Graded 0-5.

Responsible person	Tomas Roslin
Other information	For a maximum of 30 students. If this quota is exceeded, priority will be given to students with a good track record from previous studies in (agro)ecology.

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812018 Sustainable agri-food systems (AEKO501), 5-10 cr

Target group	Master's degree, visiting and exchange students in agroecology and related disciplines.
Timing	Autumn term, period II, in uneven years
Preceding studies	Basic knowledge in agroecology or related disciplines.
Objective	Through lectures and exercises, the successful student will achieve a sound understanding of structure and functioning of the food system. The student can find and interpret research reports in which ecological efficiency, environmental impacts, or use of natural resources have been studied over the whole production and consumption cycle. The student can produce a list or an illustration of key issues in all three dimensions - ecological, economic, and social - of sustainability in these systems. The student can use conceptual frameworks such as sustainable diet, or sustainable livelihoods, to address the complexity of the challenge of sustainability in agri-food systems.
Contents	The course consists of lectures (3 credit points), and of assignments (2 cp). The lecture contents are agroecology of food security, global and local food systems, life cycle assessment of food products, material flow analysis applied to food and farming, paradigms of agriculture and food in science and in society. Literature includes recent articles on the above listed issues.
Study materials and literature	The material is available at course's web-platform in Moodle.
Completion	Compulsory modules include the lectures (3 cp) and the assignments including the literature (2 cp).
Evaluation	Assignments. Graded 0-5.
Responsible person	Juha Helenius

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812025 Literature in agroecology (AEKO502), 5-10 cr

Target group	Master's degree, visiting and exchange students in agroecology and related disciplines.
Timing	According to agreement
Preceding studies	Basic knowledge in agroecology or related disciplines.
Objective	After reading the assigned literature, the student will be able to discuss agroecological issues at professional level, also issues not covered by her/his master's thesis or in other previous studies. The student can cover issues from ecological assessment of production systems, to biodiversity in agriculture, ecosystem services, and sustainability of food systems.
Contents	Reading assignments as agreed with the professor.
Study materials and literature	Literature as agreed with the professor
Completion	Literature exams, home exams, and / or learner reports Literature exams and / or learner reports
Evaluation	Grading of the exams and/or handed-in assignments.
Responsible person	Juha Helenius

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Crop Science

81258 Stress physiology (KTB403), 3 cr

Target group	Master's degree, visiting and exchange students in crop sciences and related disciplines.
Timing	Autumn term, period II.
Preceding studies	Basic knowledge in crop sciences or related disciplines.
Objective	To familiarize students with common abiotic stresses and the physiological, biochemical and molecular mechanisms behind stress tolerance
Contents	The effect of high and low temperatures, drought, flooding, soil salinity and air pollution on the growth and development of plants.
Study materials and literature	Given at the course: review papers and book chapters.
Completion	Participation in lectures, written assignments
Evaluation	Exam
Responsible person	Mervi Seppänen and Kurt Fagerstedt
Relations to other study units	KTB404 Stress physiology laboratory course

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81256 World crops (KVIL302), 5 cr

Target group	Master's degree, visiting and exchange students in crop sciences and related disciplines.
Timing	Autumn term, period II, in even years.
Preceding studies	Basic knowledge in crop sciences or related disciplines.
Objective	Students are able to introduce crops grown around the world as well as compare and investigate the management practices and the most essential yield and quality factors of some of the crops.
Contents	Introduction of different crops world-wide through lectures by visitors, teachers and students.
Study materials and literature	Given at the course
Completion	Participation in lectures, written assignments, oral presentation, group work
Evaluation	Oral presentation 50% and written assignment 50%, scale 0-5
Responsible person	Pirjo Mäkelä

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81276 Advanced training in a research group (KVIL402), 5-10 cr

Target group	Master's degree, visiting and exchange students in crop sciences and related disciplines.
Timing	According to agreement
Preceding studies	Basic knowledge in crop sciences or related disciplines.
Objective	After completing the study unit, the student has learned the basic concepts of independent work in a research group and reporting of results.
Contents	Full-time 1-2 months training period in a research group. The student participates in a small-scale research project, learns basic methods, and becomes familiar with a specified research question under the supervision of a teacher. Reading associated literature is included in the training. At the end of training, the student prepares a brief report and submits it, along with a laboratory/field book, to the teacher.

Study materials and literature	Literature associated with training project.
Completion	Research group training, report and laboratory/field book.
Evaluation	Acceptance of the report and laboratory/field book. Scale 0-5.
Responsible person	Professor

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81245 Book Summary (KVIL403), 3 cr

Target group	Master's degree, visiting and exchange students in crop sciences and related disciplines.
Timing	According to agreement
Preceding studies	Basic knowledge in crop sciences or related disciplines.
Objective	Students will acquire a deeper knowledge of a specific area in the field of crop science, often outside the available lectures, in order to be able to interpret and yield information related to these specific areas.
Contents	The student will choose a book from the field of crop science, in consultation with with the responsible teacher. The student will read the book independently, seek further information when needed, prepare a learning diary describing the learning process and write a short summary of the contents of the book.
Study materials and literature	Chosen individually depending on the interests of the student
Evaluation	Learning diary and book summary, scale 0-5
Responsible person	Pirjo Mäkelä, Mervi Seppänen and Frederick Stoddard

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Horticulture

824000 Postharvest physiology and technology (PTARH303), 5 cr

Target group	Master's degree, visiting and exchange students in horticulture and related disciplines.
Timing	Autumn term, period I, in uneven years.
Preceding studies	Good knowledge in plant physiology, horticulture or related disciplines.
Objective	A student understands the principles of postharvest physiology, storage technology and pre- and postharvest factors affecting the internal and external quality of horticultural crops.
Contents	Postharvest physiology, pre- and postharvest factors influencing the quality of horticultural products, cooling, storing and transportation
Study materials and literature	Wills, R., McGlasson, B., Graham, D. & Joyce, D. (2007) Postharvest. An Introduction to the Physiology & Handling of Fruit, Vegetables & Ornamentals.
Completion	Lectures 26 h, group work 30 h, independent study 70 h. The course includes lab exercise and an excursion.
Evaluation	Group work (a written assignment and presentation) 50 % of the final grade, exam 50 % of the final grade, scale 0-5.
Responsible person	Pauliina Palonen

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82495 Literature in Horticulture (PTARH502), 5 cr

Target group	Master's degree, visiting and exchange students in horticulture and related disciplines.
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Timing	According to agreement
Preceding studies	Basic knowledge in horticulture or related disciplines.
Objective	The student deepens his/her knowledge in horticulture related to previous studies. He/she is able to critically evaluate the literature and analyze the content in relations to his/her previous knowledge. The student can form a personal and analytical view on the topic.
Contents	The student familiarizes himself to the selected literature and looks for additional information if necessary. Based on the literature, a summary of the most relevant topics as well as reflection of the study process is presented in a form of a learning journal.
Study materials and literature	Literature (500-750 pages) can be selected from a list provided by the professor. Also other literature can be included on agreement.
Completion	Learning journal. Separate instruction can be obtained from the professor.
Evaluation	Learning journal.
Responsible person	Paula Elomaa

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Plant Breeding

81037 Molecular methods in applied plant genetics (JAL403/KBIOT403), 5 cr

Target group	Master's degree, visiting and exchange students in plant breeding, biotechnology and related disciplines.
Timing	Autumn term, period I, in even years.
Preceding studies	Basic knowledge in plant breeding, biotechnology or related disciplines.
Objective	The student will become acquainted with a range of molecular applications available, and will understand their principles and the methodologies 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.
Study materials and literature	Relevant literature will be indicated during the course.
Completion	Lectures, case studies.
Evaluation	Examination, case studies. Scale 0-5.
Responsible person	Teemu Teeri

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81045 Breeding of agricultural and horticultural crop plants (JAL504), 5 cr

Target group	Master's degree, visiting and exchange students in plant breeding and related disciplines.
Timing	Autumn term, period I, in even years.
Preceding studies	Basic knowledge in plant breeding or related disciplines.
Objective	The student will become acquainted with the practical 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.
Study materials and literature	Relevant literature will be indicated during the course.

Completion	Lectures and presentations
Evaluation	Examination (70 %) and presentation (30 %). Scale 0-5.
Responsible person	Teemu Teeri

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81100 Forest tree breeding (JAL505), 5 cr

Target group	Master's degree, visiting and exchange students in plant and forest breeding and related disciplines.
Timing	Autumn term, period I, in even years.
Preceding studies	Basic knowledge in plant and forest breeding or related disciplines.
Objective	The student will become acquainted with modern theories and practices in forest tree breeding.
Contents	Recent results and theories concerning the physiological basis and restrictions of yield production implications for breeding. Patterns of adaptation and variation in forest trees with a special reference to northern environments.
Study materials and literature	Relevant literature will be indicated during the course.
Completion	Lectures.
Evaluation	Examination. Scale 0-5.
Responsible person	Pertti Pulkkinen

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81043 Literature in plant and forest tree breeding (JAL502), 10 cr

Target group	Master's degree, visiting and exchange students in plant and forest breeding and related disciplines.
Timing	According to agreement
Preceding studies	Basic knowledge in plant and forest breeding or related disciplines.
Objective	The student will become acquainted with 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.
Study materials and literature	Selection 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) Special volume agreed with the professor; or B (Forest tree breeding): • 1) Falconer, D.S. and Mackay, T.F.C. 1996. Introduction to quantitative genetics. Longman, 4th Ed. • 2) Fins, L. et al. (Eds.) 1992. Handbook of quantitative forest tree improvement. Kluwer Academic Publishers. • 3) Special volume agreed with the professor.
Completion	Independent work. Self study
Evaluation	Examination. Scale 0-5.
Responsible person	Teemu Teeri
Other information	The exam can be taken in one or two parts.

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Plant Pathology

81331 Epidemiology and ecology (KPAT401/MPAT211), 5 cr (lectures only 2 cr)

Target group	Master's degree, visiting and exchange students in plant and forest pathology and related disciplines.
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Timing	Autumn term, period I, in even years
Preceding studies	Basic knowledge in plant or forest pathology or related disciplines.
Objective	After the course the students understand the factors and processes behind plant disease epidemics in forest and agricultural ecosystems and epidemiological background of disease management.
Contents	Basic epidemiology and examples. The biological background for epidemics, risk assessment, epidemiological mechanisms, modelling, forecasting and management of plant disease epidemics.
Study materials and literature	Wolfe, M.S. & Caten, C.E. eds. 1987. Populations of Plant Pathogens, Their Dynamics and Genetics. Blackwell Scientific Publications. B.M. Cooke, D. Gareth Jones and B. Kaye (eds).2006: The Epidemiology of Plant Diseases. Springer, Dordrecht.
Completion	Lectures, laboratory and computer exercises, written literature review and oral seminar.
Evaluation	Examination, report of laboratory and computer exercises, written and oral seminar, scale 0-5
Responsible person	Asko Hannukkala and Risto Kasanen
Other information	Visiting or exchange students get 2 credits from the course (lectures only).

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81356 Plant virology (KPAT404/MPAT205), 5 cr (lectures only 2 cr)

Target group	Master's degree, visiting and exchange students in plant and forest pathology, virology and related disciplines.
Timing	Autumn term, period II, in even years.
Preceding studies	Basic knowledge in microbiology, gene technology, plant or forest pathology or related disciplines.
Objective	After this course the student knows the most common viral diseases of cultivated plants and their control, viral particle and genome structures and plant virus infection cycles. The student understands and can apply in practice the different diagnostics methods that are used to detect plant viruses.
Contents	Identification, biology, spread and control of viruses causing plant diseases in cultivated plants. Plant viral infection cycles and virus particle structures. Diagnostics, especially serological and molecular diagnostics methods, are included in practical laboratory exercises.
Study materials and literature	Agrios, G.N. 2006. Plant Pathology. 5th ed. Academic Press, Hull, R. 2002. Matthews' Plant Virology. 4th ed. Academic Press.
Completion	Lectures, laboratory work, independent study
Evaluation	Examination and laboratory report. Scale 0-5
Responsible person	Jari Valkonen and Minna Rajamäki
Other information	Visiting or exchange students get 2 credits from the course (lectures only).

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81357 Plant pathogenic bacteria (KPAT405/MPAT204), 5 cr (lectures only 2cr)

Target group	Master's degree, visiting and exchange students in plant and forest pathology and related disciplines.
Timing	Autumn term, period II, in uneven years.
Preceding studies	Basic knowledge in microbiology, gene technology, plant or forest pathology or related disciplines.
Objective	After the course the student knows the most common plant pathogenic bacteria and their control, infection cycles and molecular and taxonomic features. The student understands the theoretical background and can apply in practise the most important diagnostic methods used to detect plant pathogenic bacteria.
Contents	Biology, morphology, spread and control of bacteria causing plant diseases in cultivated plants. Isolation of plant pathogenic bacteria from diseased samples and identification of the isolates with biochemical and molecular

	diagnostic methods are included in the practical laboratory exercises.
Study materials and literature	Agrios, G.N. 2006. Plant Pathology. 5th ed. Academic Press. Schaad, N.W., Jones, J.B. & Chun, W. 2001 (eds.) Laboratory Guide for Identification of Plant Pathogenic Bacteria, APS Press. Agrios, G.N. 2006. Plant Pathology. 5th ed. Academic Press.
Completion	Lectures, practical work, independent study.
Evaluation	Examination and laboratory report. Scale 0-5
Responsible person	Minna Pirhonen
Other information	Visiting or exchange students get 2 credits from the course (lectures only).

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81312 Literature in plant pathology (KPAT502), 5 cr

Target group	Master's degree, visiting and exchange students in plant and forest pathology and related disciplines.
Timing	According to agreement.
Preceding studies	Basic knowledge in plant or forest pathology or related disciplines.
Objective	After completing this task the student has deepened the knowledge in plant pathology by reading literature.
Contents	The latest literature in Plant Pathology within the chosen area
Study materials and literature	Chosen literature (about 500-600 pages)
Completion	Writing learning diary
Evaluation	Learning diary. Scale 0-5
Responsible person	Jari Valkonen

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Agricultural Zoology

83136 Integrated plant protection (MAEL403), 5 cr

Target group	Master's degree, visiting and exchange students in agricultural zoology and related disciplines.
Timing	Autumn term, period II, in uneven years
Preceding studies	Basic knowledge in agricultural zoology or related disciplines.
Objective	After passing the course the students understand the holistic nature of plant protection in agriculture, horticulture and in forests
Contents	Control methods for pests, diseases and weeds: principles, potential and limitations; current practices and future prospects. Currently used chemical pesticides and biocontrol agents and their role in integrated plant protection. Methods of integration of various plant protection methods in such a way that the end result is optimal for the grower, the environment, and for the society at large.
Study materials and literature	Current and recent articles and other documents on the topic
Completion	Final exam, practicals, group work and reports
Evaluation	Final exam and reports
Responsible person	Heikki Hokkanen

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83119 Literature in agricultural zoology (MAEL502), 5 cr

Target group	Master's degree, visiting and exchange students in agricultural zoology and related disciplines.
Timing	According to agreement
Preceding studies	Basic knowledge in agricultural zoology or related disciplines.
Objective	After completing this task the student has deepened the knowledge in agricultural zoology
Contents	In-depth literature on some specific topic in agricultural zoology, such as population dynamics, expert systems, biological control, integrated control, entomological microbiology.
Study materials and literature	According to agreement
Completion	Independent study
Evaluation	Literature exam
Responsible person	Heikki Hokkanen

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Environmental Engineering in Agriculture

822098 AGTEK450 Environmental technology of crop production, 7,5-15 cr

Target group	Master's degree, visiting and exchange students in environmental engineering in agriculture and related disciplines.
Timing	Autumn term, period II, in uneven years
Preceding studies	Basic knowledge in agrotechnology
Objective	After the course, participants should be able to comprehend, analyze, and solve problems, systems, and methods related to environmental technology in crop husbandry.
Contents	The course familiarizes students with the theoretical basics of environmental technology in crop husbandry: processes causing environmental loads, controlling these processes, and producing technological solution options based on systems analysis. The course will cover environmental technology options in crop husbandry (food, feed, non-food and energy) and examine the possibilities agriculture offers for recycling municipal waste safely and sustainably. During the course, students will be acquainted with the study of material and energy flows based on balance calculations, among other things, as well as the use of models as a tool of agricultural environmental technology.
Study materials and literature	Announced during the course.
Completion	Exercises, project work, examinations.
Evaluation	Exercises, project work, examinations
Responsible person	Prof. Laura Alakukku
Other information	Course can be worth 7.5 credits, with the course including the lectures and exercises, or 15 credits, with the course including also the practical exercises and project work. The lectures are given in Finnish or in English. The lecture material in English.

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822099 AGTEK460 Environmental technology of animal production, 5-15 cr

Target group	Master's degree, visiting and exchange students in environmental engineering in agriculture and related disciplines.
Timing	Autumn term, period II, in even years
Preceding	Basic knowledge in agrotechnology

studies	
Objective	After the course, participants will be able to comprehend, analyze, and solve problems, systems, and methods related to environmental technology in animal husbandry. After the course, students will have basic knowledge about hygiene issues and cleanliness technology of animal farms.
Contents	The course will deal with environmental technology issues related to different production sectors of animal husbandry (dairy and beef cattle, pig husbandry, poultry husbandry). The course will familiarize students with the theoretical basics of environmental technology in animal husbandry: processes causing environmental loads, controlling these processes, and producing technological solution options based on systems analysis. During the course, students will be acquainted with the study of material and energy flows as well as the use of models as a tool for environmental technology in agriculture. Students become familiar with the theoretical basis of hygiene issues in animal husbandry and the production of cleanliness technology solutions.
Study materials and literature	Announced during the course.
Completion	Exercises, project work, examinations.
Evaluation	Exercises, project work, examinations.
Responsible person	Prof. Laura Alakukku
Other information	Course can be worth 5 credits, with the course including the lectures and exercises, or 10 to 15 credits, with the course including also the project work as well as lectures and exercises concerning cleanliness technology. The lectures are given in Finnish or in English. The lecture material in English.

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Course descriptions in WebOodi, Spring periods III-IV

General

812092 Bioethics and legislation, 3 cr

Target group	MBIOT, HEBIOT, MScPPS, MScFood and MENVI Master's students
Timing	Spring term, period IV
Preceding studies	Bachelor's degree or equivalent in life sciences
Objective	The aim is to familiarise students with ELSA (Ethical, Legal and Social Aspects) in biological sciences
Contents	The course is composed of lectures, documentary film sessions, a panel discussion and students' presentations and divided by a two weeks' period when students prepare case study presentations on ELSA of chosen topics in small groups. The course will provide following themes: Introduction to ethical principles in science; Good scientific practices, misconduct of research and plagiarism; Science information services, public perception; ELSA in biomedical research and applications; ELSA in food production and food security, in agricultural practices, in environmental matters and in current issues in developing countries (climate change, biodiversity, bio-energy and patenting issues)
Study materials and literature	Material will be provided during the course
Completion	Lectures, films and a panel discussion; Group work (preparation and presentation of the case studies); Independent study (learning diary)
Evaluation	Attendance 85%; Active contribution to the panel discussion; Active contribution to the preparation and presentation of the case study; Learning diary. Scale: Pass/fail
Responsible person	MBIOT, HEBIOT, MScPPS, MScFood and MENVI coordinators
Other information	Priority is given to HEBIOT, MBIOT, MScPPS, MScFood and MENVI Master's students

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812147 Seminars in plant production biology (KTB501), 3 cr

Target group	Master's degree, visiting and exchange students in plant production sciences, biotechnology and related disciplines.
Timing	Seminar presentations on Tuesdays at 14-16, both autumn and spring term.
Preceding studies	Basic knowledge in plant production sciences, biotechnology or related disciplines.
Objective	To familiarize students with current research problems in plant production science. To present scientific results (MSc students only).
Contents	Presentation of the results and conclusions of your own MSc thesis (MSc students only). There will be a monthly seminar from a member of scientific staff of the Department of Agricultural Sciences.
Completion	Participation in eight MSc seminars. Presentation of own results in a seminar and writing an abstract of the results, acting as an opponent to one seminar (MSc students only).
Evaluation	Pass/Fail
Responsible person	Paula Elomaa
Relations to other study units	MSc thesis (MSc students only)
Other information	1 credit of information and communication technology studies (ICT) is integrated in the course. Visiting or exchange students get 1 credits from the course (participation in eight seminar days only). More information: https://wiki.helsinki.fi/display/KTB501seminaarit/Seminaariajat_Seminar_times

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Agroecology

812025 Literature in agroecology (AEKO), 5-10 cr

Target group	Master's degree, visiting and exchange students in agroecology and related disciplines.
Timing	According to agreement
Preceding studies	Basic knowledge in agroecology or related disciplines.
Objective	After reading the assigned literature, the student will be able to discuss agroecological issues at professional level, also issues not covered by her/his master's thesis or in other previous studies. The student can cover issues from ecological assessment of production systems, to biodiversity in agriculture, ecosystem services, and sustainability of food systems.
Contents	Reading assignments as agreed with the professor.
Study materials and literature	Literature as agreed with the professor
Completion	Literature exams, home exams, and / or learner reports Literature exams and / or learner reports
Evaluation	Grading of the exams and/or handed-in assignments.
Responsible person	Juha Helenius

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Crop Science

812099 Crop physiology (KTB401), 3 cr

Target group	Master's degree, visiting and exchange students in crop sciences, horticulture and related disciplines.
Timing	Spring term, period III.

Preceding studies	Basic knowledge in crop sciences, horticulture or related disciplines.
Objective	Students are able to generalize how environment and genotype affect yield formation of crops. They can derive from basic physiology, such as nitrogen, carbon and hormone metabolism, the foundations for yield formation in crops.
Contents	Physiology of yield formation of crops. Nitrogen, carbon and hormone metabolism in crops. Basic concepts, such as NUE, RUE, WUE and their role in yield formation.
Study materials and literature	Literature given during the course
Completion	Lectures and essays
Evaluation	Exam, scale 0-5
Responsible person	Pirjo Mäkelä
Relations to other study units	This course complements the practicals course, KTB405 Crop physiology practicals.

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81257 Field crop quality (KVIL303), 3 cr

Target group	Master's degree, visiting and exchange students in crop sciences and related disciplines.
Timing	Spring term, period IV.
Preceding studies	Basic knowledge in crop sciences or related disciplines.
Objective	Students will understand the factors determining quality in the main field crops, their chemistry and biochemistry, and how they are affected by the environment. Students will be able to generalize about the factors that determine a given quality attribute in different crops and then seek specifics relevant to an individual crop.
Contents	Introduces the most important quality aspects of the main crops and methods of assessing quality: what components determine quality for a given end use, how these are determined genetically and how they may be affected by growing conditions.
Study materials and literature	Given at the course: review papers and book chapters.
Completion	Participation in lectures and written assignments
Evaluation	Home exams, scale 0-5.
Responsible person	Frederick Stoddard
Relations to other study units	The course complements the practicals course , KVIL304 Field crop quality laboratory course

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81276 Advanced training in a research group (KVIL402), 5-10 cr

Target group	Master's degree, visiting and exchange students in crop sciences and related disciplines.
Timing	According to agreement
Preceding studies	Basic knowledge in crop sciences or related disciplines.
Objective	After completing the study unit, the student has learned the basic concepts of independent work in a research group and reporting of results.
Contents	Full-time 1-2 months training period in a research group. The student participates in a small-scale research project, learns basic methods, and becomes familiar with a specified research question under the supervision of a teacher. Reading associated literature is included in the training. At the end of training, the student prepares a brief report and submits it, along with a laboratory/field book, to the teacher.
Study materials and literature	Literature associated with training project.

Completion	Research group training, report and laboratory/field book.
Evaluation	Acceptance of the report and laboratory/field book. Scale 0-5.
Responsible person	Professor

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81245 Book Summary (KVIL403), 3 cr

Target group	Master's degree, visiting and exchange students in crop sciences and related disciplines.
Timing	According to agreement
Preceding studies	Basic knowledge in crop sciences or related disciplines.
Objective	Students will acquire a deeper knowledge of a specific area in the field of crop science, often outside the available lectures, in order to be able to interpret and yield information related to these specific areas.
Contents	The student will choose a book from the field of crop science, in consultation with with the responsible teacher. The student will read the book independently, seek further information when needed, prepare a learning diary describing the learning process and write a short summary of the contents of the book.
Study materials and literature	Chosen individually depending on the interests of the student
Evaluation	Learning diary and book summary, scale 0-5
Responsible person	Pirjo Mäkelä, Mervi Seppänen and Frederick Stoddard

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Horticulture

52728 / 81085 Plant biotechnology and molecular biology (KBOT300), 5 cr

Target group	Master's degree, visiting and exchange students in plant biotechnology, plant production sciences and related disciplines.
Timing	Spring term, period III
Preceding studies	Basic knowledge in plant biotechnology, plant production sciences, molecular biology or related disciplines.
Objective	The student will become acquainted with the basics of plant biotechnology and molecular biology, and related legislation and risk assessment.
Contents	Lectures will familiarize students with structures and function of plant genome; Molecular biology of Agrobacterium-mediated gene transfer; Pathways to plant secondary metabolites; Molecular basis of vegetative-reproductive transitions and flower development; Structure and function of cytoskeleton proteins; Molecular biology of light perception and signal transduction in plants; Molecular basis of abiotic and biotic stress responses in plants; Forest biotechnology; Plant secondary metabolism; Basics of plant gene isolation methods and gene transfer methods to plants; Basics for legislation and risk assessment of plant biotechnology; Introduction to applications and ethics of plant biotechnology.
Study materials and literature	Lecture material and additional reading given by the lecturers in Moodle. Buchanan, B.B, Grissem, W & Jones, R.L., 2002: Biochemistry and Molecular Biology of Plants. 1408 pages (relevant parts).
Completion	Lecture course
Evaluation	Short written assignment, final examination. Scale 0-5
Responsible person	Prof. Teemu Teeri (Dept. of Agricultural Sciences), Doc. Pekka Heino and Prof. Jaakko Kangasjärvi (Dept. of Biosciences)
Other information	The course is given jointly by the Department of Biosciences and the Department of Agricultural Sciences (course abbreviation KBOT300). Registration code for all students is 52728. This year the course will be also organized as a joint course with Aalto University. Please note that if you are planning to take the 52518/KBOT301 Practical Course in Plant Biotechnology, you have to attend the 'Vectors for plant transformation' and the 'Gene transfer to plants' lectures

in this lecture series.

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812099 Crop physiology (KTB401), 3 cr

Target group	Master's degree, visiting and exchange students in crop sciences, horticulture and related disciplines.
Timing	Spring term, period III.
Preceding studies	Basic knowledge in crop sciences, horticulture or related disciplines.
Objective	Students are able to generalize how environment and genotype affect yield formation of crops. They can derive from basic physiology, such as nitrogen, carbon and hormone metabolism, the foundations for yield formation in crops.
Contents	Physiology of yield formation of crops. Nitrogen, carbon and hormone metabolism in crops. Basic concepts, such as NUE, RUE, WUE and their role in yield formation.
Study materials and literature	Literature given during the course
Completion	Lectures and essays
Evaluation	Exam, scale 0-5
Responsible person	Pirjo Mäkelä
Relations to other study units	This course complements the practicals course, KTB405 Crop physiology practicals.

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82422 Photobiology (PTARH402), 5 cr

Target group	PhD, Master's degree, visiting and exchange students in horticulture, crop sciences and related disciplines.
Timing	Spring term, period III or IV, in uneven years. The course is organized as a one-week intensive course. The exact timing will be informed in WebOodi.
Preceding studies	Good knowledge in plant physiology or related disciplines.
Objective	The student can describe the general physical properties of light and can analyze how natural variation in light climate and light spectrum affects plant growth and development as well as production. The student can explain the structure and function of currently known photoreceptors and the signal cascades that control vegetative and reproductive development of plants. The student understands current methods to measure photosynthesis and learns recent challenges in photosynthesis research. The student can describe how artificial lighting is applied in controlled greenhouse production. Selected research articles are presented in student seminars where the student learns presentation skills as well as to critically evaluate the articles in the light of the topics dealt during the course.
Contents	Physical properties of light. Photoreceptors, light perception and signalling in plants. Influence of light on growth and development of plants (photomorphogenesis, phototropism, stomatal movement). Photoperiodism. Interaction of light and other growth factors. Current status of photosynthesis research. Artificial lighting in greenhouse production.
Study materials and literature	Preparatory reading (articles) is provided prior the course. McDonald, M. 2003: Photobiology of higher plants. John Wiley & Sons Ltd., England. p. 354.
Completion	Full-day course. Lectures, demonstrations and compulsory seminars.
Evaluation	Seminars. Home examination.
Responsible person	Paula Elomaa
Other information	The course is organized jointly with the Department of Agricultural Sciences, the Department of Biosciences and the Finnish Graduate School in Plant Biology.

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82492 Horticulture for human well-being (PTARH403), 5 cr

Target group	Master's degree, visiting and exchange students in horticulture and related disciplines.
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Timing	Spring term, period IV, in uneven years.
Preceding studies	Basic knowledge in horticulture or related disciplines
Objective	The student can recognize the connection between nature experiences and human health, and analyze the environment from the point of view of well-being. The student can apply social, physical and psychological knowledge to the planning of therapeutic horticultural applications and healing environments.
Contents	Basic concepts and theories, research from different disciplines studying the interaction between nature and human health, practical applications of green care.
Study materials and literature	Scientific articles and other material will be indicated during the course.
Completion	Lectures 20 h, seminars 4 h, group work 48 h, independent study including writing of a learning diary 60 h.
Evaluation	Accepted learning diary, article assignment 30% of the final grade, group work 70% of the final grade, scale 0-5.
Responsible person	Erja Rappe

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82495 Literature in Horticulture (PTARH502), 5 cr

Target group	Master's degree, visiting and exchange students in horticulture and related disciplines.
Timing	According to agreement
Preceding studies	Basic knowledge in horticulture or related disciplines.
Objective	The student deepens his/her knowledge in horticulture related to previous studies. He/she is able to critically evaluate the literature and analyze the content in relations to his/her previous knowledge. The student can form a personal and analytical view on the topic.
Contents	The student familiarizes himself to the selected literature and looks for additional information if necessary. Based on the literature, a summary of the most relevant topics as well as reflection of the study process is presented in a form of a learning journal.
Study materials and literature	Literature (500-750 pages) can be selected from a list provided by the professor. Also other literature can be included on agreement.
Completion	Learning journal. Separate instruction can be obtained from the professor.
Evaluation	Learning journal.
Responsible person	Paula Elomaa

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Plant Breeding

52728 / 81085 Plant biotechnology and molecular biology (KBOT300), 5 cr

Target group	Master's degree, visiting and exchange students in plant biotechnology, plant production sciences and related disciplines.
Timing	Spring term, period III
Preceding studies	Basic knowledge in plant biotechnology, plant production sciences, molecular biology or related disciplines.
Objective	The student will become acquainted with the basics of plant biotechnology and molecular biology, and related legislation and risk assessment.
Contents	Lectures will familiarize students with structures and function of plant genome; Molecular biology of Agrobacterium-mediated gene transfer; Pathways to plant secondary metabolites; Molecular basis of vegetative-reproductive transitions and flower development; Structure and function of cytoskeleton proteins; Molecular biology of light perception and signal transduction in plants; Molecular basis of abiotic and biotic stress responses in plants; Forest biotechnology; Plant secondary metabolism; Basics of plant gene isolation methods and gene transfer methods to plants; Basics for

	legislation and risk assessment of plant biotechnology; Introduction to applications and ethics of plant biotechnology.
Study materials and literature	Lecture material and additional reading given by the lecturers in Moodle. Buchanan, B.B, Gruissem, W & Jones, R.L, 2002: Biochemistry and Molecular Biology of Plants. 1408 pages (relevant parts).
Completion	Lecture course
Evaluation	Short written assignment, final examination. Scale 0-5
Responsible person	Prof. Teemu Teeri (Dept. of Agricultural Sciences), Doc. Pekka Heino and Prof. Jaakko Kangasjärvi (Dept. of Biosciences)
Other information	The course is given jointly by the Department of Biosciences and the Department of Agricultural Sciences (course abbreviation KBOT300). Registration code for all students is 52728. This year the course will be also organized as a joint course with Aalto University. Please note that if you are planning to take the 52518/KBOT301 Practical Course in Plant Biotechnology, you have to attend the 'Vectors for plant transformation' and the 'Gene transfer to plants' lectures in this lecture series.

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81039 Selection breeding and experimental designs (JAL401), 5 cr

Target group	Master's degree, visiting and exchange students in plant breeding and related disciplines.
Timing	Spring term, period III, in even years.
Preceding studies	Basic knowledge in plant breeding, genetics or related disciplines.
Objective	The student will become acquainted with the process of selection breeding and 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.
Study materials and literature	Relevant literature will be indicated during the course.
Completion	Lectures and presentations.
Evaluation	Examination 70% and presentation 30%. Scale 0-5.
Responsible person	Teemu Teeri

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81041 Conservation of plant genetic resources (JAL402), 5 cr

Target group	Master's degree, visiting and exchange students in plant breeding and related disciplines.
Timing	Spring term, period IV, in even years.
Preceding studies	Basic knowledge in plant breeding, genetics or related disciplines.
Objective	The student will become acquainted with the importance of genetic variation and plant genetic resources, and will know how to assess and conserve genetic resources.
Contents	The nature of biological diversity, applications of ecological genetics to plant breeding, practical management of germplasm. Presentations by students.
Study materials and literature	Relevant literature will be indicated during the course
Completion	Lectures, study diary and presentations.
Evaluation	Study diary 70% and presentation 30%. Scale 0-5.
Responsible person	Helena Korpelainen

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81043 Literature in plant and forest tree breeding (JAL502), 10 cr

Target group	Master's degree, visiting and exchange students in plant and forest breeding and related disciplines.
Timing	According to agreement
Preceding studies	Basic knowledge in plant and forest breeding or related disciplines.
Objective	The student will become acquainted with 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.
Study materials and literature	Selection 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) Special volume agreed with the professor; or B (Forest tree breeding): • 1) Falconer, D.S. and Mackay, T.F.C. 1996. Introduction to quantitative genetics. Longman, 4th Ed. • 2) Fins, L. et al. (Eds.) 1992. Handbook of quantitative forest tree improvement. Kluwer Academic Publishers. • 3) Special volume agreed with the professor.
Completion	Independent work. Self study
Evaluation	Examination. Scale 0-5.
Responsible person	Teemu Teeri
Other information	The exam can be taken in one or two parts.

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Plant Pathology

81312 Literature in plant pathology (KPAT502), 5 cr

Target group	Master's degree, visiting and exchange students in plant and forest pathology and related disciplines.
Timing	According to agreement.
Preceding studies	Basic knowledge in plant or forest pathology or related disciplines.
Objective	After completing this task the student has deepened the knowledge in plant pathology by reading literature.
Contents	The latest literature in Plant Pathology within the chosen area
Study materials and literature	Chosen literature (about 500-600 pages)
Completion	Writing learning diary
Evaluation	Learning diary. Scale 0-5
Responsible person	Jari Valkonen

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Agricultural Zoology

83208 Biological control of insect pests and weeds (MAEL402), 3 cr

Target group	Master's degree, visiting and exchange students in agricultural zoology and related disciplines.
Timing	Spring term, period IV, in uneven years
Preceding studies	Basic knowledge in agricultural zoology or related disciplines.

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.
Study materials and literature	Hokkanen, H. M. T. & Lynch, J.M. (Eds:) 1995. Biological Control: Benefits and Risks. Cambridge University Press. 290 pp.
Completion	Lectures 26, practical work 20, independent study 134 h.
Evaluation	Final exam.
Responsible person	Heikki Hokkanen

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83119 Literature in agricultural zoology (MAEL502), 5 cr

Target group	Master's degree, visiting and exchange students in agricultural zoology and related disciplines.
Timing	According to agreement
Preceding studies	Basic knowledge in agricultural zoology or related disciplines.
Objective	After completing this task the student has deepened the knowledge in agricultural zoology
Contents	In-depth literature on some specific topic in agricultural zoology, such as population dynamics, expert systems, biological control, integrated control, entomological microbiology.
Study materials and literature	According to agreement
Completion	Independent study
Evaluation	Literature exam
Responsible person	Heikki Hokkanen

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Animal Breeding

81580 Estimation of variance components (KEJAL450), 5 cr

Target group	Master's degree, visiting and exchange students in animal breeding and related disciplines.
Timing	Spring term, period IV, in uneven years.
Preceding studies	Linear models and selection index theory (KEJAL410) or equivalent courses.
Objective	After the course students know the models and methods used in estimation of variance components and can apply them to example datasets.
Contents	Mixed models, simulation of data, characteristics of estimation methods, expected values, variances and covariances, Henderson methods I, II ja III, Maximum Likelihood, Restricted Maximum Likelihood, software used in estimation of variance components.
Study materials and literature	Information about the study material is given during the lectures.
Completion	Lectures and practicals.
Evaluation	Examination and practicals.
Responsible person	Adjunct Professor Ismo Strandén

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81586 Genomic selection (KEJAL470), 3 cr

Target group	Master's degree, visiting and exchange students in animal breeding and related disciplines.
Timing	Spring term, period IV
Preceding studies	Linear models and selection index theory (KEJAL410) or equivalent courses in linear mixed models methods, linear regression modeling, elementary linear algebra, genetic evaluation and breeding schemes.
Objective	After the course the student understands the basic concept of genomic information and its use in genomic evaluation. The student can estimate the genomic relationships and inbreeding from marker data and knows how to utilize genomic breeding values in breeding programs.
Contents	The course provides an introduction to statistical methods and genetic principles behind genomic selection. Basic concepts of genomic breeding value estimation based on molecular markers as well as some concepts of population genetics will be covered. Use of genomic selection in breeding programs and controlling the inbreeding will also be covered. There will be several teachers and each of them will take slightly different view points to the problem.
Study materials and literature	Information about the study material is given during the lectures.
Completion	Lectures and practicals.
Evaluation	Examination and practicals.
Responsible person	Prof. Jarmo Juga

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