The aim of the Master programme Ecology is to provide you with the knowledge, skills and insight required to operate as an independent professional and to be a suitable candidate for a subsequent course of study leading to a career in Ecological research. After having completed the programme, you will have developed a critical scientific approach and an awareness of the ethical and societal aspects of Ecology.

You can find all regulations applying to the classes and examinations of the Master’s programme in Ecology in the Academic and Examination Regulations of the Master’s Programme Ecology at the FALW website.

The programme has two specialisations: ‘Ecology and Evolution’ and ‘Environmental Chemistry and Toxicology’. These specialisations are organised in close cooperation with the University of Amsterdam (UvA). This implies that some (course) components will take place at the Science Park of UvA and others at the VU campus. In all courses teachers of both universities will be participating.

When registered in the MSc Ecology programme of the VU you will also automatically be registered as a ‘bijvakstudent’ at the UvA (similarly for UvA students). You will thus be assigned a VUnetID and a UvAnetID. You should enrol for VU (course) components at: vunet.vu.nl using your VUnetID and for UvA (course) components: http://datanose.nl/#masterenrol with your UvAnetID.

Each course is given at one or the other university, so teachers move between classes. In general elective courses are given every two years (except Adaptive Dynamics and Biodiversity and Landscapes that can be taken every year).

You can find the content, study load and other details of each of the course modules in the course descriptions in this guide.

The year schedule 2012 - 2013 can be found at the FALW-website.

Further information about the MSc programme Ecology.

A complete programme description can be found at the FALW-website.
## Inhoudsopgave

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Expired programme components Ecology

MSc Ecology, spec. Ecology and Evolution

Programme components:
- spec. Ecology and Evolution year 1

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Master Ecology, specialisation Ecology and Evolution, year 1

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MSc Ecology, spec. Environmental Chemistry and Toxicology

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MSc Ecology - optional course 2nd year

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Ecotoxicology and Environmental Quality

| Vakcode                           | AM_470512 ()               |
| Periode                           | Periode 2                  |
| Credits                           | 6.0                        |
| Voertaal                          | Engels                     |
| Faculteit                         | Fac. der Aard- en Levenswetenschappen |
| Coördinator                       | prof. dr. ir. J. Legler    |
| Docent(en)                        | dr. ir. C.A.M. van Gestel, prof. dr. ir. J. Legler, dr. ir. T.H.M. Hamers |
| Lesmethode(n)                     | Hoorcollege, Practicum     |

Doel vak
The course Ecotoxicology and Environmental Quality has 4 main aims:
1. The development of theoretical knowledge on contaminants in the environment, and their effects on organisms in the ecosystem and environmental quality
2. The determination of ecotoxicological effects of chemicals with laboratory research
3. The development of a critical academic attitude in environmental management issues, where a blend of scientific information and socio-economic arguments form key ingredients in decision-making processes.
4. The organization of a scientific symposium

Inhoud vak
This course is jointly organized by the VU University Amsterdam and the University of Amsterdam.
The course focuses on contamination of aquatic and terrestrial ecosystems, from the molecular chemistry of major groups of toxicants to the impacts at the molecular, cellular, individual, population, and ecosystem level. During mini symposia, students are challenged to discuss the state of the art with (internationally) well-known guest lecturers. By turn, students have to take the role of chair during these mini-symposia. Topics include: chemical characteristics of major groups of toxicants, bioavailability, molecular mechanisms of toxicity, mixture toxicity and multistress, effects on the population and ecosystem level, ecotoxicological diagnosis, water and sediment quality criteria and the EU Water Framework Directive.

In the first week of the course, students participate in a laboratory practical course where they will gain experience in ecotoxicity testing using methods from bacteria to cell to whole organism, including molecular biological techniques. Students will evaluate scientific literature and the results of experimental research to assess the risk of environmental contaminants for ecosystem health. The practical ends with a scientific symposium, in which the students will present to each other the results of the experimental work.

Mini-symposia: 70 hours
Study time: 50 hours
Laboratory practical course: 40 hours

Toetsvorm
The course is completed with a written exam (50% of mark), presentation by chairs of mini-symposia (25%) and a presentation of the laboratory practical course (25%). Performance of students as chair of the mini symposia, in which scientists will present course topics, will be part of the assessment. The student has passed if the final mark is equal to or higher than 6.0 in a range from 1-10.

Literatuur
Syllabus containing scientific literature

Vereiste voorkennis
BSc in Biology, Ecology, Biomedical Sciences, Health Sciences, Earth Sciences or Chemistry

Overige informatie
Takes place at: VU University Amsterdam, Institute for Environmental Studies, De Boelelaan and University of Amsterdam, Science Park, Kruislaan.

Environmental Chemistry and Toxicology I

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Doel vak
This course, which can be followed together with the course Environmental Chemistry and Toxicology II, will teach you to evaluate the exposure to and effects of chemicals in the environment. Environmental Chemistry and Toxicology (ECT) integrates two disciplines: environmental chemistry and environmental toxicology. This ECT I course focuses on environmental toxicology, which deals with effects of chemicals in the environment on wildlife and human health, covering the realm of effects ranging from molecular and cellular to whole organism and ecosystem effects. Environmental toxicology in itself is a multidisciplinary field encompassing various aspects of biology, ecology and risk assessment. Environmental chemistry deals with the sources and fate of chemicals, as well as their environmental partitioning and transport, degradation and deposition, and is covered in the course ECT II (AM_1033).

General aim:
The main aim of the course Environmental Chemistry and Toxicology I is to understand the biological effects of chemicals in the environment on organisms, including humans.

Learning objectives
At the end of the course you will have learned
1. The main questions and key concepts in the field of environmental toxicology
2. To think critically in environmental quality and risk assessment issues
3. To present scientific results (both written and oral) and place them in the appropriate scientific context

Inhoud vak
Students will obtain a sound theoretical background in the major concepts in toxicology. Topics include chemical uptake and metabolism, biochemical and physiological effects, community and population effects. Major groups of toxicants that will be discussed include pesticides, persistent organic pollutants and endocrine disrupting chemicals, as well as mixture toxicity. Toxicity testing and dose-response modeling are covered. One important aspect of the course is the risk assessment of chemicals: when do we say that the exposure to a chemical is safe and when is it hazardous? Students will learn how to perform a risk assessment as it is done in the real world, taking into account the exposure, effects on humans and wildlife, and other mitigating factors.

Onderwijsvorm
This course contains a series of lectures, seminars and working classes. Students prepare a scientific report on the risk assessment of chemicals and present their results in a series of presentations.

Toetsvorm
The course is completed with a written exam worth 50% of the final mark. The risk assessment report is worth 25% of the final mark. A series of 3 presentations and the participation of the students in the course make up the final 25% of the course. The student has passed if the final mark is equal to or higher than 5.5 in a range from 1-10. Each component of the course (exam, report and presentations) must achieve a 5.0 or higher to pass.

Literatuur
Vereiste voorkennis
This course is open to all Master students with a BSc in Biology, Biomedical Sciences, Ecology or Chemistry. It is a compulsory course for MSc Ecology – ECT track students. For more information and to determine if you have sufficient background to take this course, please contact the coordinator (juliette.legler@vu.nl)

Doelgroep
This course is open to all Master students with a Biology, Ecology or Chemistry BSc. It is a compulsory course for MSc Ecology – ECT track students and can be followed in combination with ECT II (see AM_1033).

Environmental Chemistry and Toxicology II

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<td>prof. dr. ir. J. Legler</td>
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<tr>
<td>Docent(en)</td>
<td>dr. ir. C.A.M. van Gestel, prof. dr. ir. J. Legler, dr. ir. T.H.M. Hamers</td>
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Doel vak
This course in environmental chemistry has the main aim of understanding processes that chemicals undergo in the environment. The course is taught at the UvA. It can be followed together with the course Environmental Chemistry and Toxicology I, which focuses on environmental toxicology.

Inhoud vak
This course describes the behaviour and fate of natural and man-made chemicals in water, soil and air and the organisms present therein. Topics include transport and distribution processes, and physico/biochemical reactions of compounds in environmental conditions; environmental soil chemistry; bioavailability, bioaccumulation, metabolism, and degradation of chemicals; biomonitoring, prediction and fate modelling in environmental compartments; biogeochemical cycles, structure property/activity relationships.

Onderwijsvorm
This course contains a series of lectures, seminars and working classes.

Toetsvorm
The final mark will be determined by a written exam

Literatuur
Vereiste voorkennis
For more information and to determine if you have sufficient background to take this course, please contact the coordinator (email: pim.de.voogt@uva.nl)

Doelgroep
Bachelors preferably in Earth Sciences or Chemistry but also Biology or other Natural Sciences may be possible. This course is open to all Master students with a Biology, Ecology or Chemistry BSc. It is a compulsory course for MSc Ecology – ECT track students and can be followed in combination with ECT I (see AM_1032).

Overige informatie
To take this course, students must register temporarily (bijvakstudent) at the UvA (see course description UvA-site).

Ethics in Life Sciences

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Doel vak
To provide a toolbox of ethical instruments to analyze properly moral problems related (to one's own) research in the life sciences
• To acquire conceptual knowledge of the central concepts in applied philosophy and professional ethics
• To challenge an ethical reflection on one owns life science specialization and to open it for an impartial and constructive discussion
• To exercise a team based project to enter prepare and execute a moral dialogue
• To acquire the necessary skills to handle ethical issues in an accountable manner, as a professional academic beyond one's own inclinations and prejudgments

Inhoud vak
Researchers in life sciences generate the knowledge that builds the future of our society. Therefore, professional academics should be accountable for their decisions, experimental designs and presentation of results. In this short course, the principles of justification will be illustrated with cases of technology ethics and medical ethics. The way an ethical review committee on animal research works, is simulated by a role play exercise on an actual research protocol. Finally, as a small group training project, an ethical dialogue is prepared and executed together with another team.
Onderwijsvorm
Lectures, workgroups, group assignment with presentation

Toetsvorm
• Degree of intellectual participation in the workgroups (10%)  
• exam (50%) has to be passed  
• written and verbal execution of the ethical dialogue (40%)

Literatuur
Available on Blackboard

Vereiste voorkennis
Bsc Biology, Biomedical Sciences, Psychology with profile Biological Psychology or Neuropsychology

Doelgroep
Compulsory course in all FALW Master programmes, except Health Sciences

Overige informatie
Lectures in English, part of the workgroups are in Dutch. All presentations and plenary discussions in English. Attendance is compulsory.

Evolution of Species Interactions

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Doel vak
Objectives of the course Evolution of Species Interaction: To analyse phylogenetic patterns of interacting species (endosymbiont-host, plant-pollinator, and insect herbivore-plant associations); to analyse the major traits that maintain these interactions and how these traits evolve; to formulate hypotheses how species interactions evolve and how this might lead to new species. The course focusses on chemical signals in intra- and interspecific communication (chemical ecology).

Inhoud vak
Topics include advanced phylogenetic techniques, phylo-/bio-geography, analysis of (in)congruence between phylogenetic trees of interacting groups of species, character trait evolution, intra- (sex pheromones) and interspecific (secondary plant compounds) chemical communication, evolution of signalling systems (receptor proteins), phylogenetic conservatism in host use, evolution of specialisation (evolutionary dead-end), and sexual selection and speciation models. Relevant techniques will be demonstrated or practiced in small experiments [e.g., behavioural assays, gas-chromatography (GC), mass spectrometry, electrophysiology (both olfaction and taste recording from insect sensory organs) and coupled GC-electrophysiology to aid the identification of biologically active compounds].
Onderwijsvorm
Discussion of literature & poster (1,5 EC), lectures (3 EC) and practicals/demonstrations (1.5 EC)

Toetsvorm
Written examination (essay) 70%, practicals 20% and attitude 10%

Literatuur
Reader (ca. 10 euro)

Vereiste voorkennis
Bachelor Biology

Overige informatie
Co-ordinator: dr. P. Roessingh
Science Park 904 kamer C2.209
+31 20 5257732
Lecturers: prof. dr. S.B.J. Menken, dr Toby Kiers (VU) and dr. P. Roessingh.
Registration via studieweb (UvA, at least 4 weeks before the start of the semester) and VUnet (VU, at least 4 weeks before the start of the period).
The course schedule will be published on Blackboard and on the website www.student.uva.nl (choose the specific master).
Minimum 4, maximum 24 students.
A supplementary programme for foreign students is available (mandatory for major projects).
Location: Science Park Amsterdam.

Evolutionary Dynamics

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Doel vak
Understanding the principles of the theory of Adaptive Dynamics, the similarities and differences with Quantitative Genetics and being able to apply the tools of these theories to simple population-dynamical models.

Inhoud vak
This course is delivered at the UvA. For more information see this link. http://studiegids.uva.nl/web/uva/sgs/en/c/14382.html

Onderwijsvorm
Studying the theory on the basis of literature and discussion meetings with the lecturer, and a computer assignment (3 hours), in the first week and part of the second week; working out a hands-on assignment in
the second-fourth week; writing report in the fourth week.

**Toetsvorm**
The grade is based on the report of the hands-on assignment (90%) and on the discussion meetings and computer assignment (10%)

**Literatuur**
Handouts

**Vereiste voorkennis**
BSc in Biological Sciences or Biomedical Sciences

**Aanbevolen voorkennis**
Participants must have background knowledge of theoretical population dynamics, i.e. the use of difference/differential models in ecology (e.g. Lotka-Volterra models). Study basic chapters from P. Yodzis, Introduction to Theoretical Ecology (Harper & Row, 1989) or similar books as preparation, or inquire with the lecturer, C.J.M.Egas@uva.nl.

**Doelgroep**
Master students Ecology and Evolution and Biology. The course is also open for students from the master programmes Biological Sciences, Physics and Mathematics.

**Overige informatie**
Registration for the course:
- via VUnet
- via the course coordinator, dr. C.J.M. Egas, at least 4 weeks before the start of the semester.
Tel. +31 20 5257748, e-mail C.J.M.Egas@uva.nl.
Location: University of Amsterdam, Science Park 904, Amsterdam.
This course is taught in English.

### Experimental Design and Analysis

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**Doel vak**
After the course, students:
- Are acquainted with possible experimental designs and can select the most suitable design depending on experimental objective and hypothesis
- Are acquainted with possible statistical analyses, understand the theory and the assumptions underlying the various analyses and can test the underlying assumptions
- Can select the most suitable statistical analysis depending on the design chosen and the statistical assumptions
- Can interpret the chain of hypotheses, design and analysis to validate hypotheses on-field-conditions and model behaviour
Inhoud vak
A proper experimental design combined to a suitable statistical analysis is essential to -ecological- science, even though it is considered by many as a necessary evil. In this course, the whole chain of hypothesis and design to analysis and interpretation is covered to allow students to apply these techniques independently. The application -and not the mathematics- of the techniques is the basis. Possible experimental designs are discussed in relation to specific biological questions and hypotheses. The application of statistical analysis is treated in relation to these designs. Theory and especially the assumptions underlying the test are treated to the extent that this information is necessary to apply the tests properly. Both -combinations of- regression and analysis of variance techniques and multivariate analysis techniques like PCA, similarity analysis and meta analysis are dealt with. Other biological questions like classification issues, working with large datasets, data reduction and multiple response variables are discussed.

Onderwijsvorm
As application is central to this course, case studies, assignments and working with real biological data is the core of this course. Starting of with the research question, hypothesis and the lab/field/model situation a proper design and statistical analysis are discussed. A specific case study, explained by the researcher who performed that particular research, is used to follow this chain of arguments. Theory, assumptions and tests are all treated in the context of these case studies and are coupled directly to the case study and assignments. The course is finalised with a case study using your own question and data, e. g. from your own BSc- or MSc- project, to which the theory is applied.

Toetsvorm
Assignments and report on the final case study

Literatuur
Experimental design and data analysis for biologists by G.P. Quinn and M.J. Keough, Cambridge University Press

Vereiste voorkennis
Methodology and statistics 1 and 2 or equivalent statistics courses (contact lecturer in the latter case)

Doelgroep
The course is compulsory for MSc Ecology students at the VU doing the Ecology and Evolution or the Environmental Chemistry and Toxicology specialization and for UvA students doing the Ecology and Evolution specialization of the master Biological Science. The course is also open for master students in Biology, Ecology or Earth Sciences and PhD students at the VU and UvA universities with a deficiency in experimental design and statistics.

Overige informatie
The course is organized by the Department of Ecological Science at the VU and the Institute for Biodiversity and Ecosystem Dynamics of the UvA. All contact hours are at VU University.

Literature Survey Ecology
Doel vak
For master students in Ecology and Evolution it is required to carry out a thesis based on a literature survey (12 ec). The literature survey can focus on a fundamental ecological question but may also take a more applied approach. The aim is to demonstrate the ability to efficiently process material in a given field and evaluating this critically. The topic and research question are free of choice.

Inhoud vak
Every literature survey has to be approved by the master coordinator in advance (on behalf of the examination board). Therefore you should hand in a proposal that you have discussed with the faculty staff member or external supervisor. The project proposal includes the following topics:
1) A short description of the research theme and the scientific and societal (if applicable) relevance of your work.
2) From this you develop one or more clearly formulated and structured research questions. This is an important point: loosely formulated research questions always produce bad science.
3) The search engine(s) and keywords that you think you will use and a basic design of your thesis.
4) Name(s) of the supervisor(s), and in case you do a survey under supervision outside our own institute you also give their background and the address/e-mail of their institute.
5) A time schedule.
Prior to participating in any thesis or literature survey, both student and faculty staff member and/or external supervisor involved should fill out a written application and agreement form. This form (for thesis and literature surveys) and the general regulations for internships and literature study can be downloaded from:
http://www.falw.vu.nl/en/students/regulations/internship-literature-study-regulations/
Use the form for the Health and Life Sciences. The form concerns details on supervision, amount of time to be invested, allotted study credits, safety regulations, etc. At the end of the literature survey the student gives a presentation of the work in the Department of Ecology.

Toetsvorm
There is a special assessment form (attached to the application form) that has to be filled out by the first and second lecturer/supervisor. Literature theses will be will be assessed according to the following categories:
A. Execution (25%)
B. Thesis (50%)
C. Oral Presentation (25%)
The forms have to be handed to the co-ordinator of the master programme and the student secretary. The master co-ordinator approves or rejects the projects on behalf of the examination board.
In order to have the mark registered, the student should hand in an electronic copy of the thesis, the signed assessment form and an evaluation form at the FALW programme secretariat.

**Overige informatie**
Language of tuition: Dutch

### Masterclasses in Ecology and Evolution

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**Doel vak**
To obtain a broad overview of the latest research in ecology and evolution
- To learn to critically evaluate scientific research articles
- To practice skills of scientific argumentation and discussion
- Learning to discuss these topics with leading scientists in the field

**Inhoud vak**
Being able to participate in discussion is an important skill for scientists. It requires the ability to combine theoretical and empirical knowledge as well as a critical view on the arguments put forward by others. The best way to improve these skills is to practice them under supervision of senior scientists. In this course students are trained to discuss the important topics in Ecology and Evolution with top scientists in the world, in the form of a masterclass (described below). In doing so, students will attend seminars from these internationally renowned scientists in the Nature of Life meetings organized by the Institute of Ecological Sciences (VU) and in the series of IBED lectures organized by the Institute for Biodiversity and Ecosystem Dynamics (UvA). Both series are organized on a monthly basis throughout the year (except the summer period). The topics for the seminars cover the whole spectrum of ecology and evolution. An overview of upcoming and previous seminars can be found at www.falw.vu.nl/nl/onderzoek/ecological-sciences/nature-of-life-meetings/index.asp and www.science.uva.nl/ibed-agenda/see.cfm. Students must attend six masterclasses during the 2-year programme. Students may attend more theme lectures on a facultative basis, subject to availability.

**Onderwijsvorm**
In preparation for each masterclass, several recent papers by the guest speaker will be studied and extensively discussed during a tutorial meeting with staff members of the Institute of Ecological Sciences or of the Institute for Biodiversity and Ecosystem Dynamics. Students then participate in a discussion meeting with the speaker (the actual masterclass), and finally they attend the seminar as part of the course. Students are required to participate actively in the discussion during the tutorials, masterclass and the seminar.
Toetsvorm
Factors which count for the final grade:
For each masterclass: active participation, theoretical insight, and argumentation of the students in the tutorial meeting, masterclass and seminar: 100%
Students pass after 6 satisfactorily participated masterclasses.

Literatuur
Primary literature and recent articles by the guest speakers, to be announced at least one week before each masterclass.

Vereiste voorkennis
BSc Biology from a Dutch University. Students with a BSc in Earth Sciences, Social Geography, Beta/Gamma, and international BA's with Nuffic accreditation can be admitted, but extra elements can be obligatory.

Doelgroep
Master students in Biology and Ecology (from both the Ecology and Evolution as well as the Environmental Chemistry and Toxicology specializations) at the VU and master students from the Biological Sciences specialization Ecology and Evolution at the UvA. This course is also open to PhD students from the SENSE research school.

Overige informatie
Location: VU University Amsterdam, De Boelelaan 1085 Amsterdam and University of Amsterdam, Science Park 904 Amsterdam

Microbial Ecology

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<tr>
<td>Lesmethode(n)</td>
<td>Hoorcollege, Computerpracticum, Practicum</td>
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Doel vak
To provide students with an introduction to microbial diversity and microbial ecology with a strong emphasis on recent molecular biological and genomics developments in this field.

Study goals:
1. Be aware of the enormous microbial diversity in nature, its role in the cycling of chemical elements and its potential in the application in biotechnology and ecosystem services.
2. Be able to understand and explain the different diagnostic tools that are currently available to study the diversity and activity of microorganisms in natural and man-made environments.
3. Can explain the global element cycles and the functional groups of microorganisms that catalyze the reactions in these cycles.
4. Can analyze sequence data with different software programs and corelate diversity to environmental parameters.
5. Can carry out a literature study, summarize it in an essay and present it to other students.

**Inhoud vak**
This course is delivered at the UvA. For more information follow this link: http://studiegids.uva.nl/web/uva/sgs/en/c/14424.html

**Onderwijsvorm**
Lectures, computer practical, and short research projects

**Toetsvorm**
Students will be graded based upon a written examination at the end of the course, as well as the quality of their project and the performance in the computer lab. These evaluations will be weighted as follows: 50% written exam, 35% student project, 15% computer practical.

**Literatuur**
Brock – Biology of Microorganisms
Handouts of the lectures
Key articles and literature references on the different topics.
Course materials will be provided to all participants prior to and during the course via Blackboard.

**Overige informatie**
Teaching staff: prof. dr. G.A. Kowalchuk (VU staff) & prof. dr. G. Muyzer (UvA staff)

**Research Project Ecology and Evolution I**

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**Doel vak**
The research projects serve to get students acquainted and experienced with the practice of ecological research. Both research projects should thus reside in Ecology. At the end of the project a scientific report of the work has to be written in English an oral presentation has to be given also in English. If you have 12 ec elective courses in your programme both research projects together will have to amount up to 75 ec. If you have 18 ec elective courses the total study load is 69 ec. The shortest project should at least be 30 ec.

**Inhoud vak**
For research projects in the Ecology department check the website: www.falw.vu.nl/nl/onderzoek/ecological-sciences/internships-at-the-institute.
If you want to do a project outside the VU you may look for internships at the websites of other Dutch universities or research institutes, for example: NIOO (fundamental ecological research), NIOZ (marine ecology), IMARES (fisheries and sea research), ALTERRA (applied and environmental...
ecology), RIVM (applied and environmental ecology), SOVON (avian ecology), but also at the sites of nature conservation organisations such as Natuurmonumenten, Staatsbosbeheer, or regional authorities (Provincie and Waterschap). However, organisations for the conservation of specific species (f.e. butterflies, dolphins, tigers, primates, etc.) will generally not be qualified enough. Research projects/internships in commercial companies are generally also not accepted, since commercial and educational interests often are quite different. Projects at universities or research institutes outside the Netherlands are also accepted provided they are of sufficient academic quality.

In all cases: take care that you will be working on an ecological research question and that you will be able to collect enough reliable data to write a scientific report in the end. Purely monitoring or inventory projects will not be allowed.

**Onderwijsvorm**

Every research project (and literature survey) has to be approved by the master coordinator in advance (on behalf of the examination board). Therefore you should hand in a project proposal that you have discussed with the faculty staff member or external supervisor. The project proposal includes the following topics:

1) A short description of the research theme and the scientific and societal relevance of your work.

2) From this you develop one or more clearly formulated and structured research questions. This is an important point: loosely formulated research questions always produce bad science.

3) An explanation of the design of your research. What are you going to do to get an answer to your research question? Here you might also indicate which statistical methods you are going to apply.

4) An expectation of how the results would look like under your hypothesis.

5) Name(s) of the supervisor(s), and in case you do a project outside our own institute you also give their background and the address/e-mail of their institute.

6) A time plan and in case of field work or work abroad a description of the research facilities.

7) A safety analysis if you plan to go to a non-western country.

Prior to participating in any thesis or literature survey, both student and faculty staff member and/or external supervisor involved should also fill out a written application and agreement form. This form (for thesis and literature surveys) and the general regulations for internships and literature study can be downloaded from www.falw.vu.nl/en/students/regulations/internship-literature-study-regulations.

Use the form for the Health and Life Sciences. The form concerns details on supervision, amount of time to be invested, allotted study credits, safety regulations, etc. At the end of the project the student gives a presentation of the work in the Department of Ecology.

**Toetsvorm**

There is a special assessment form (attached to the application form) that has to be filled out by the first and second lecturer. Projects and literature theses will be will be assessed according to the following categories:

A. Practical Execution and Attitude (25%)

B. Professional Development (10%)

C. Scientific Execution and Content of the Report (50%)

D. Layout and Form of the Report (5%)
E. Oral Presentation (10%)
The forms have to be handed to the co-ordinator of the master programme and the student secretary. The master co-ordinator approves or rejects the projects on behalf of the examination board.
In order to have the mark registered, the student should hand in an electronic copy of the thesis (via Blackboard), the signed assessment form and an evaluation form to the programme secretariat.

Overige informatie
The Research project year II has no official course code yet, since it will only take place as from 2013 - 2014. Still this is the description:
Course objective
The research projects serve to get students acquainted and experienced with the practice of ecological research. Both research projects should thus reside in Ecology. At the end of the project a scientific report of the work has to be written in English an oral presentation has to be given also in English. If you have 12 ec elective courses in your programme both research projects together will have to amount up to 75 ec. If you have 18 ec elective courses the total study load is 69 ec. The shortest project should at least be 30 ec.

Course content
For research projects in the Ecology department check the website: www.falw.vu.nl/nl/onderzoek/ecological-sciences/internships-at-the-institute.
If you want to do a project outside the VU you may look for internships at the websites of other Dutch universities or research institutes, for example: NIOO (fundamental ecological research), NIOZ (marine ecology), IMARES (fisheries and sea research), ALTERRA (applied and environmental ecology), RIVM (applied and environmental ecology), SOVON (avian ecology), but also at the sites of nature conservation organisations such as Natuurmonumenten, Staatsbosbeheer, or regional authorities (Provincie and Waterschap). However, organisations for the conservation of specific species (f.e. butterflies, dolphins, tigers, primates, etc.) will generally not be qualified enough. Research projects/internships in commercial companies are generally also not accepted, since commercial and educational interests often are quite different. Projects at universities or research institutes outside the Netherlands are also accepted provided they are of sufficient academic quality.
In all cases: take care that you will be working on an ecological research question and that you will be able to collect enough reliable data to write a scientific report in the end. Purely monitoring or inventory projects will not be allowed.

Form of tuition
Every research project (and literature survey) has to be approved by the master coordinator in advance (on behalf of the examination board). Therefore you should hand in a project proposal that you have discussed with the faculty staff member or external supervisor. The project proposal includes the following topics:
1) A short description of the research theme and the scientific and societal relevance of your work.
2) From this you develop one or more clearly formulated and structured research questions. This is an important point: loosely formulated research questions always produce bad science.
3) An explanation of the design of your research. What are you going to do to get an answer to your research question? Here you might also indicate which statistical methods you are going to apply.
4) An expectation of how the results would look like under your
hypothesis.
5) Name(s) of the supervisor(s), and in case you do a project outside our own institute you also give their background and the address/e-mail of their institute.
6) A time plan and in case of field work or work abroad a description of the research facilities.
7) A safety analysis if you plan to go to a non-western country.

Prior to participating in any thesis or literature survey, both student and faculty staff member and/or external supervisor involved should also fill out a written application and agreement form. This form (for thesis and literature surveys) and the general regulations for internships and literature study can be downloaded from www.falw.vu.nl/en/students/regulations/internship-literature-study-regulations.

Use the form for the Health and Life Sciences. The form concerns details on supervision, amount of time to be invested, allotted study credits, safety regulations, etc. At the end of the project the student gives a presentation of the work in the Department of Ecology.

Type of assessment
There is a special assessment form (attached to the application form) that has to be filled out by the first and second lecturer. Projects and literature theses will be will be assessed according to the following categories:
A. Practical Execution and Attitude (25%)
B. Professional Development (10%)
C. Scientific Execution and Content of the Report (50%)
D. Layout and Form of the Report (5%)
E. Oral Presentation (10%)
The forms have to be handed to the co-ordinator of the master programme and the student secretary. The master co-ordinator approves or rejects the projects on behalf of the Examination board.
In order to have the mark registered, the student should hand in an electronic copy of the thesis (via Blackboard), the signed assessment form and an evaluation form to the programme secretariat.

Research Project Env. Chem. and T. I

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Research Project Env. Chem. and T. II

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Scientific Writing in English

Doel vak
The aim of this course is to provide the writing student with the essential linguistic means for producing English academic texts which are effective, idiomatically and stylistically appropriate and grammatically correct.

Inhoud vak
The initial focus in the course lies on the form of scientific texts in the Earth and Life Sciences:
- Abstract (or summary)
- Introduction
- Methods
- Results
- Discussion

General course outline
Introducing the topics:
- Academic and technical writing in English
- The characteristics of different kinds of scientific texts
- How scientific writing is judged and assessed
- Where do you find your information and how do you present it?
- How to avoid committing plagiarism
- Who am I writing for? What do I want to say?
- Your readership
- Key parts of an academic article: title, abstract, introduction, methods, results and discussion

Writing the actual article
Paragraph and sentence construction: how do I link paragraphs together?
- Writing simple and complex sentences. Active and passive sentences.
- Argumentation: how do I put an argument? How do I frame my own opinion?
- Should I use "I" or "we"?

Writing correct English
- Use of apostrophes and colons
- Word order, verb tenses, time and tense
- Avoiding mistakes typically made by Dutch writers
- Common spelling mistakes
You will be making considerable use of peer assessment: examining fellow students’ written work and giving them feedback. This method provides useful insights into how a text might be improved. The process of providing someone else with feedback on their text is something that you will find very instructive.

**Onderwijsvorm**
The course is focused on self-tuition. The plenary sessions concentrate on the process of writing and the product of writing. Homework is part of the course (6-8 hours per session). With each topic, participants work through a phased series of exercises that usually conclude with the requirement to write a short piece of text. The instructor will append extensive written remarks to this text.

**Toetsvorm**
Students will receive their credits only when they have participated in the classes and also when they have handed in all of the assignments satisfactorily. Students will receive a ‘pass’ when they have finished the course, or a ‘fail’ if they don’t.

**Literatuur**
Last year’s reader will not be used anymore! (this update: August 28, 2012)

**Doelgroep**
This course is only open to students of specific two-year Master’s programmes of the Faculty Earth and Life Sciences (see list of programmes above).

**Overige informatie**
- To do well, students are required to attend all lessons. Group schedules to be found at rooster.vu.nl and Blackboard;
- A VUnet registration for this course automatically gives access to the corresponding Blackboard site. Group registration only takes place via Blackboard (general groups: registration by students following FALW programmes containing this course, groups assigned to specific studies: registration via programme and course coordinator);

As for the general groups: unfortunately, course overlap is possible possible. You'll have to try, possibly with fellow students, to arrange a little schedule bending with either course co-ordinator. No guarantees though.

Please note:
- if you have registered for a group in Blackboard, you are expected to take part in all eight meetings. If you do withdraw, do that in time, both on Blackboard and in VUnet. This all will avoid a “fail” on your grade list for not taking part in this course, and allows other students to fill in a possible very wanted group spot.
In case of specific Blackboard matters concerning this course you can either e-mail m.j.i.loeve@vu.nl or mvandenhoorn@taalcentrum-vu.nl.

**Soil-Plant-Animal Interactions**

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Doel vak
Students will be able to:

- Underpin the importance of ecological interactions between the soil-subsystem and the plant-subsystem
- Critically evaluate and investigate the relevant interactions between soil-soil organisms, soil-vegetation, and soil organisms-vegetation
- Critically evaluate and investigate the relevant functional traits that underlie ecological interactions between the soil-subsystem and plant-subsystem
- In the field: apply different techniques to survey the soil-subsystem and plant-subsystem, and to sample soil and soil organisms in the field
- In the laboratory: investigate soil organisms and carry out ecological and biochemical analyses relevant to plant-soil interactions.

Inhoud vak
A hot theoretical topic in Ecology concerns the interdependency of belowground (green web) and aboveground compartments (brown web). This comprises key conceptual issues relating to interactions between above- and belowground communities, the importance of functional traits to understand these interactions in the community, and the processes carried out by each component. These concepts can be applied to current critical questions, such as the regulation and function of biodiversity, vegetation development, and consequences of human-induced global change, e.g. biological invasions, extinctions, nitrogen deposition, land use change.

In this course we will focus theoretically on the following subjects:

- The brown food web: biotic interactions and regulators
- Plant species and plant trait control of soil biota and processes
- Belowground consequences of green food web interactions
- Completing the circle: how soil food web effects are manifested aboveground

- The regulation and function of biological diversity, with a focus on functional traits of plants, animals and microbes
- Global change phenomena in an aboveground-belowground context

These subjects are discussed in various papers (see literature) that will be used as the basic literature for the seminars given by the (guest) lecturers. In the second week, students will perform experiments on location (in Abisko, N-Sweden) where soil-plant interactions in subarctic ecosystems are currently being studied, with emphasis on (a) design and statistical treatment of soil-plant experiments, (b) techniques to identify soil organisms and analyses soil processes, biochemistry and vegetation development.
**Toetsvorm**
A seminar about one of the papers/chapters in the reader (25%), individual performance in critical group discussions about important theory based on these papers/chapters (25%), a final presentation (50%) about background, design and results of own research project.

**Literatuur**
Reader with selected literature, which includes recent key papers in international journals and extracts from David A. Wardle (2002): “Communities and Ecosystems”: linking the aboveground and belowground component (Monographs in Population Biology nr 34). Princeton University Press.

**Vereiste voorkennis**
To attend this course their will be costs involved. To cover the expenses for the reader, travel to Swedish Lapland and accommodation a substantial fee is asked from MScC students.

**Doelgroep**
MSc students with focus on ecology.

**Spatial Analysis for Ecologists**

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**Doel vak**
Students will be able to:
Understand the capabilities and limitations of Geographical Information Systems (GIS) for ecologists;
Design and set up a spatial analyses for an ecological research question;
Acquire spatial data using Global Positioning System (GPS), Remote Sensing images, and other methods;
Evaluate the quality of spatial data, and thus the result of the analyses;
Apply spatial analyse techniques using a Geographical Information System (GIS);
Visualise research results in meaningful maps.

**Inhoud vak**
Spatial Analysis for Ecologists is a course for students who want to explore the spatial component of ecology. Spatial analyses techniques are used e.g. for monitoring of natural areas, environmental assessment studies and in scientific research of spatial phenomena. Examples of
spatial phenomena are connectivity of ecological networks, spatial distribution of plant and animal species and bird migration. These spatial phenomena can have different spatial scales: local, regional, national, international and global. An example of local phenomena is patchiness of the vegetation. Local variables that influence this phenomenon can be seed dispersal, slope, soil parameters and plant species etc. Processes on the lowest level are also influenced by processes on a higher spatial scale. The patchiness of the vegetation on the local scale will, in process of time, be influenced for example by climate change.

This course wants to provide a thorough theoretical background and a fundamental set of software skills. The software used during the course is ArcGIS. Topics covered in the course are:

- What is GIS
- Spatial Data types
- Spatial Data quality
- Remote Sensing Techniques
- Visualisation
- Set up of a spatial analyses
- Spatial modelling in ecology
- Spatial statistics
- Mobile GIS (with GPS) for field work

The applications of spatial analyses in ecology are diverse. Examples of the different types of spatial analyses, spatial modelling and spatial statistics in the literature and lectures will illustrate this.

The second part of the course is a case study, where the theory and skills acquired in the first part of the course will be applied on an existing spatial phenomenon. Students will work mainly independent, alone or in pairs, to analyse this spatial phenomena using ArcGIS software. VU Students can get their own copy of the GIS software for installation and use at their own PC or laptop at home.

**Toetsvorm**
Examination on theory; report on case study

**Literatuur**

**Vereiste voorkennis**
Only open to second-year students MSc Biology (spec. Ecology) and MSc Ecology

**Overige informatie**
Minimum amount of registrations for the course to take place: 10.
2012 - 2013 is the last year of offering.