



Ecology MSc

Vrije Universiteit Amsterdam - Fac. der Aard- en Levenswetenschappen - M Ecology - 2016-2017

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.

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.

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).

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.

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

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 VUnet.

The year schedule can be found at [VUnet](#).
Further information about the MSc programme [Ecology](#).

Note: Not every course is given each year, so please consult the year schedules for further information.

Inhoudsopgave

Expired programme components Ecology	1
MSc Ecology, spec. Environmental Chemistry and Toxicology	1
Specialization Ecology and Evolution	3
Vak: (Bio)Molecular Spectroscopy (Periode 5)	4
Vak: Assessment of Natural and Chemical Hazards (Periode 4)	5
Vak: Biogeochemical Cycles (Periode 2)	5
Vak: Current Trends in Evolution ()	5
Vak: Ecosystem Services and Scientific Advocacy (Periode 1)	6
Vak: Ecotoxicology and Water Quality (Periode 2)	7
Vak: Environmental and Human Toxicology (Periode 1)	9
Vak: Environmental Chemistry (Periode 1)	9
Vak: Environmental Genomics and Adaptation ()	10
Vak: Environmental Measuring Techniques (Periode 4)	11
Vak: Ethics in Life Sciences (Periode 3)	12
Vak: Evolution of Species Interaction (Periode 2)	13
Vak: Experimental Design and Analysis (Periode 2)	13
Vak: Literature Survey Ecology and Evolution (Ac. Jaar (september))	16
Vak: Literature Survey Environmental Chemistry and Toxicology (Ac. Jaar (september))	17
Vak: Mass Spectrometry (Periode 2)	18
Vak: Masterclasses in Ecology and Evolution (Ac. Jaar (september))	19
Vak: Microbial Ecology (Periode 1)	20
Vak: Research Project Ecology and Evolution 1 (Ac. Jaar (september))	20
Vak: Research Project Ecology and Evolution II (Ac. Jaar (september))	22
Vak: Research Project Environmental Chemistry and Toxicology I (Ac. Jaar (september))	24
Vak: Research Project Environmental Chemistry and Toxicology II (Ac. Jaar (september))	26
Vak: Scientific Writing in English (AM_ECOL) (Periode 4)	28
Vak: Separation Sciences (Periode 1)	30
Vak: Soil-Plant-Animal Interactions (Periode 1)	31
Vak: Spatial Processes in Ecology ()	33
Vak: Value of Ecosystem Services (Periode 1)	33

Expired programme components Ecology

The course programme components presented in the list below will no longer be part of the examination programme in academic year 2015-2016.

The course Ethics in Life Sciences (AM_470707) will not be part of the E&E specialization anymore.

Evolutionary Dynamics (AMU_0007)

Vakken:

Naam	Periode	Credits	Code
Environmental and Human Toxicology	Periode 1	6.0	AM_1184
Environmental Chemistry	Periode 1	6.0	XMU_437004

MSc Ecology, spec. Environmental Chemistry and Toxicology

This specialization is organized by the Institute for Environmental Studies of the VU University in cooperation with Institute of Biodiversity and Ecosystem Dynamics of the University of Amsterdam (UvA) and the Department of Analytical Chemistry and Applied Spectroscopy of the VU. Students registered at VU University who have successfully completed the Environmental Chemistry and Toxicology programme will obtain an MSc diploma in Ecology with a specialization in Environmental Chemistry and Toxicology.

The programme has four components:

1) Compulsory courses (30 ec), to be taken in the year of arrival

- Environmental and Human Toxicology (AM_1184, 6 ec)
- Environmental Chemistry (AM_0020, 6 ec)
- Ecotoxicology and Water Quality (AM_1054, 6 ec)
- Experimental Design and Analysis (AM_470505, 6 ec)
- Scientific Writing in English (AM_1157, 3 ec)
- Ethics (AM_470707, 3 ec)

2) Elective courses (18 ec), choose 12 ec from the list below

- Spatial Processes in Ecology and Evolution (AMU_0009, 6 ec)
- Environmental Genomics and Adaptation (AM_470506, 6 ec)
- Nature of life meetings (AM_1016, 3 ec)
- Biochemical Cycles (AMU_0002, 6 ec)
- Assessment of Natural and Chemical Hazards (AMU_0001, 6 ec)
- Environmental Measuring Techniques (AMU_0005, 6 ec)
- Separation Sciences (X_435609, 6 ec)
- Molecular Spectroscopy (X435062, 6 ec)
- Mass Spectrometry (X_435604, 6 ec)
- Ecosystem Services and Scientific Advocacy (AM_1053, 6 ec)
- Value of Ecosystem Services and Biodiversity (AM_468024, 6 ec)

3) Research projects (60-66 ec)

Students will have to carry out two research projects/internships. A minor theses of 30 ec and a major thesis of 30- 36 ec. Students are encouraged to complete one project at their home university and the

other elsewhere at another university or research institute. Both projects will focus on Environmental Chemistry or Toxicology. All research projects and internships have to be approved by the master coordinator in advance. Approval will take place on the basis of a project proposal written by the student. Please check the course description of the Research Project for more detailed information.

4) Literature thesis (12 ec)

Students are required to carry out a literature thesis of 12 ec. The literature thesis can focus on a fundamental question in Environmental Chemistry or Toxicology, but may also take a more applied or societal approach. The subject of the thesis has to be approved by the master coordinator on the basis of a proposal written by the student. Please check the course description of the Literature Thesis for more detailed information.

For the time schedule please check:

<http://www.falw.vu.nl/en/students/schedules/Year-planning/index.asp>

Coordinator MSc Ecology specialisation Environmental Chemistry and Toxicology:

Juliette Legler, juliette.legler@vu.nl, tel: 020-5989516

Vakken:

Naam	Periode	Credits	Code
(Bio)Molecular Spectroscopy	Periode 5	6.0	X_435062
Assessment of Natural and Chemical Hazards	Periode 4	6.0	AMU_0001
Biogeochemical Cycles	Periode 2	6.0	AMU_0002
Ecosystem Services and Scientific Advocacy	Periode 1	6.0	AM_1053
Ecotoxicology and Water Quality	Periode 2	6.0	AM_1054
Environmental and Human Toxicology	Periode 1	6.0	AM_1184
Environmental Chemistry	Periode 1	6.0	XMU_437004
Environmental Genomics and Adaptation		6.0	AM_470506
Environmental Measuring Techniques	Periode 4	6.0	AMU_0005
Ethics in Life Sciences	Periode 3	3.0	AM_470707
Experimental Design and Analysis	Periode 2	6.0	AM_470505
Literature Survey Environmental Chemistry and Toxicology	Ac. Jaar (september)	12.0	AM_1132
Mass Spectrometry	Periode 2	6.0	X_435604
Masterclasses in Ecology and Evolution	Ac. Jaar (september)	3.0	AM_1016

Research Project Environmental Chemistry and Toxicology I	Ac. Jaar (september)	30.0	AM_1108
Research Project Environmental Chemistry and Toxicology II	Ac. Jaar (september)	30.0	AM_1113
Scientific Writing in English (AM_ECOL)	Periode 4	3.0	AM_1157
Separation Sciences	Periode 1	6.0	X_435609
Value of Ecosystem Services	Periode 1	6.0	AM_468024

Specialization Ecology and Evolution

This specialization is organized by both the Department of Ecological Science (DES) of the VU University and the Institute of Biodiversity and Ecosystem Dynamics (IBED) of the University of Amsterdam (UvA). When you are registered at VU University and have successfully completed the Ecology and Evolution programme you will obtain an MSc diploma in Ecology with a specialization in Ecology and Evolution.

The programme has four components:

1) Compulsory courses (18 ec)

- Current Trends in Evolution (AMU_0003, 6 ec)
- Experimental Design and Analysis (AM_470505, 6 ec)
- Master classes in Ecology and Evolution (AM_1016, 3 ec)
- Scientific Writing in English (AM_1157, 6 ec)

2) Elective courses (12 - 18 ec)

- Environmental Genomics and Adaptation (AM_470506, 6 ec)
- Soil-Plant-Animal Interactions (AM_470507, 6 ec)
- Spatial Processes in Ecology and Evolution (AM_0009, 6 ec)
- Microbial Ecology (AMU_0008, 6 ec)
- Ecosystem Services and Scientific Advocacy (AM_1053, 6 ec)
- Evolution of Species Interactions (AMU_0006, 6 ec)

3) Two research projects (72 - 78 ec)

Students will have to carry out two research projects/internships. The shortest should be 30 ec at least. The first internship has to take place at the VU or UvA, the second may be carried out elsewhere at another university or research institute. Both projects will focus on Ecology and/or Evolution. All

research projects and internships have to be approved by the master coordinator in advance. Approval will take place on the basis of a project proposal written by the student. Please check the course description of the Research Project and the Internship Manual for more detailed information.

4) Literature thesis (12 ec)

Students are required to carry out a literature thesis of 12 ec. The literature thesis can focus on a fundamental question in Ecology and Evolution, but may also take a more applied or societal approach. The subject of the thesis has to be approved by the master coordinator on the basis of a proposal written by the student. Please check the course description of the Literature Thesis and the Thesis

Manual for more detailed information.

For the time schedule please check:

<http://www.falw.vu.nl/en/students/schedules/Year-planning/index.asp>

Coordinator MSc Ecology specialization Ecology and Evolution:

Gerard Driessen, room H-142, 020-5987046, g.j.j.driessen@vu.nl

Vakken:

Naam	Periode	Credits	Code
Current Trends in Evolution		6.0	AMU_0003
Ecosystem Services and Scientific Advocacy	Periode 1	6.0	AM_1053
Ecotoxicology and Water Quality	Periode 2	6.0	AM_1054
Environmental Genomics and Adaptation		6.0	AM_470506
Evolution of Species Interaction	Periode 2	6.0	AMU_0006
Experimental Design and Analysis	Periode 2	6.0	AM_470505
Literature Survey Ecology and Evolution	Ac. Jaar (september)	12.0	AM_1131
Masterclasses in Ecology and Evolution	Ac. Jaar (september)	3.0	AM_1016
Microbial Ecology	Periode 1	6.0	AMU_0008
Research Project Ecology and Evolution 1	Ac. Jaar (september)	30.0	AM_1100
Research Project Ecology and Evolution II	Ac. Jaar (september)	30.0	AM_1114
Scientific Writing in English (AM_ECOL)	Periode 4	3.0	AM_1157
Soil-Plant-Animal Interactions	Periode 1	6.0	AM_470507
Spatial Processes in Ecology		6.0	AMU_0009

(Bio)Molecular Spectroscopy

Vakcode	X_435062 (435062)
Periode	Periode 5
Credits	6.0
Voertaal	Engels
Faculteit	Faculteit der Exacte Wetenschappen
Coördinator	prof. dr. G.W. Somsen
Examinator	prof. dr. G.W. Somsen
Docent(en)	prof. dr. G.W. Somsen
Lesmethode(n)	Hoorcollege
Niveau	400

Inhoud vak

<http://studiegids.uva.nl/xmlpages/page/2016-2017/zoek-vak>

Overige informatie

This course is part of the MSc Chemistry (joint degree) and is offered at the UvA. For more information contact: FNWI Education Service Centre, Science Park 904, servicedesk-esc-science@uva.nl, +31 (0)20 525 7100. Enrolment via <https://m.sis.uva.nl/vakaanmelden> is required.

Assessment of Natural and Chemical Hazards

Vakcode	AMU_0001 ()
Periode	Periode 4
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen

Inhoud vak

<http://studiegids.uva.nl/xmlpages/page/2015-2016/zoek-vak/vak/7775>

Overige informatie

This course is offered at the UvA. For more information contact: FNWI Education Service Centre, Science Park 904, servicedesk-esc-science@uva.nl, +31 (0)20 525 7100. Enrolment via <https://m.sis.uva.nl/vakaanmelden> is required.

Biogeochemical Cycles

Vakcode	AMU_0002 ()
Periode	Periode 2
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen

Inhoud vak

<http://studiegids.uva.nl/xmlpages/page/2016-2017/zoek-vak/vak/25384>

Current Trends in Evolution

Vakcode	AMU_0003 ()
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen

Inhoud vak

<http://studiegids.uva.nl/xmlpages/page/2015-2016/zoek-vak/vak/74140>

Intekenprocedure

This course is offered at the UvA. For more information contact: FNWI Education Service Centre, Science Park 904, servicedesk-esc-science@uva.nl, +31 (0)20 525 7100.

Enrolment via <https://m.sis.uva.nl/vakaanmelden> is required.

Ecosystem Services and Scientific Advocacy

Vakcode	AM_1053 ()
Periode	Periode 1
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	prof. dr. J.A. Harvey
Examinator	prof. dr. J.A. Harvey
Lesmethode(n)	Hoorcollege

Doel vak

1. To stimulate the students in developing critical ways to evaluate and interpret scientific information, and particularly information on issues related to society, ecosystem services and the environment.
2. To teach students to filter through a large body of information that broaches both science and society.

The final attainment levels of this course include that students

1. understand the natural (ecological) economy and the many ways in which it sustains the material (human) economy through the provisioning of conditions and processes that underpin civilization.
2. have the ability to evaluate the ways in which humans impact nature and how this is intimately linked with population and consumption patterns that differ between nation states.
3. know how to determine how sustainable (or not) different nations of the world are.
4. have the skills to critically evaluate the efficacy of information presented by various sources (the media, internet etc.) on scientific and environmental processes and problems.
5. can assess the role of scientists in studying and disseminating the results of their research to society, and whether their views should cross the threshold into the policy arena.

Inhoud vak

Four main topics with varying overlap and several themes.

1. Ecosystem services (ES); initial discussion of important ecosystem services (focusing on provisioning and supporting e.g. fisheries, crops, nutrient cycling, soil fertility, pest control etc. Five to six lectures envisaged by J. Harvey and several guest speakers. Assignment for students: provide an example of an ES that has been valued (quantifiably) by economists. Try and find one that falls in to the category of 'supporting' because these are the most problematic in terms of valuation and prepare a short presentation. Following this, discussion groups are assembled to debate and argue over the over- or under-valuation of the services studied. Votes are taken amongst the student body before and after the debate to see whose arguments are most convincing.
2. Indices measuring human impact on the biosphere and on important ES. Focuses on ecological footprint analyses (EFA) and how they relate to nation states and the biosphere as a whole. Five to six lectures

envisaged by J. Harvey and several guest speakers. Assignment: select a country and evaluate/calculate its ecological footprint in an essay. Is the country sustainable? How much must it reduce its footprint to achieve sustainability?

3. Critical evaluation of information on ecology and environmental issues. How accurate is the media in covering issues such as climate change and biodiversity loss? What other sources of information compete for public attention? How accurate are blogs and web sites on the internet? Are there hidden (or not-so-hidden) agendas that are at work? How does one deal with the huge amount of information at our disposal? Five to six lectures envisaged by J. Harvey and several guest speakers. Assignment: presentation of an analysis of a newspaper or internet article on a recent environmental issue. Evaluate its accuracy of information and possible alternate agenda.

4. The role of scientists: how far should we step outside of the university and research labs in disseminating information? The costs (professional risks) and benefits (pro-active) of becoming involved in societal debates. Lectures by prominent scientists. Assignment: write a critical review or evaluation of an important environmental issue, and design a plan for accurately conveying information on the subject to the public through the media or internet.

Onderwijsvorm

Lectures and Workshops

Attendance at guest lectures is mandatory

Toetsvorm

Based on essays (50%) and presentations and contributions to workshops (50%)

Literatuur

Selected papers and book chapters, and hand outs of lectures

Vereiste voorkennis

BSc in Biology, Earth and Economy, Future Planet Studies or Bèta-gamma with a minor in environmental science or ecology. Students with other previous education should contact the course coordinator.

Doelgroep

MSc students with a focus on the interface of ecology and society. The maximum number of participants is 50. Priority is granted to students in the MSc Ecology and Evolution programme of the VU and UvA.

Ecotoxicology and Water Quality

Vakcode	AM_1054 ()
Periode	Periode 2
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. ir. T.H.M. Hamers
Examinator	dr. ir. T.H.M. Hamers
Docent(en)	dr. ir. T.H.M. Hamers
Lesmethode(n)	Hoorcollege, Practicum

Doel vak

At the end of this course, students will have:

1. Gained theoretical knowledge of contaminants in the environment, their effects on organisms and ecosystems, and the assessment of water quality
2. Learned to determine the ecotoxicological effects of chemicals with laboratory toxicity testing
3. Developed a critical academic attitude in environmental management issues by combining scientific information and socio-economic arguments

Inhoud vak

This course focuses on the effects of contamination of aquatic ecosystems, from the molecular chemistry of major groups of toxicants to their impacts at the molecular, cellular, individual, population, and ecosystem level.

The first part of the course is a laboratory practical, in which students gain hands-on experience in ecotoxicity testing using methods from bacteria, aquatic invertebrates and fish. Both whole-organism and molecular biological techniques are taught. Students will evaluate scientific literature and the results of their experimental research to assess the risk of environmental contaminants for ecosystem health. At the end of the practical, students will present the results of their experimental work in a poster presentation.

The second part of the course is theoretical and will teach the student the state of the art in ecotoxicology. It is designed as a scientific symposium with invited lectures by internationally renowned guest lecturers as well as PhD candidates who present their PhD research in ecotoxicology. Students take the role of chairperson during the symposium and introduce the speakers, ask questions and discuss critical issues. Topics include emerging compounds, molecular mechanisms of toxicity, community effects, global environmental problems, and chemical regulation. Scientific literature will be given as background information on each topic. The symposium is finalized with oral presentations in which students present a critical evaluation of the topics presented.

Onderwijsvorm

- Laboratory practical course: 60 hours
- Lectures (introduction to practicals + scientific symposium): 24 hours
- Independent study

Toetsvorm

1. Participation in laboratory practical course, including lab journal (15%)
2. Poster presentation of the laboratory practical course (35%).
3. Oral presentation of scientific symposium (15%)
4. Written exam of 10 open questions (35% of mark)

The student has passed if each of the components has received a minimum of 5.0, and the final mark is equal to or higher than 5.5, in a range from 1-10.

Literatuur

Protocols for the laboratory practical will be provided.
For the theoretical part of the course, scientific articles will be provided by guest lecturers.

Vereiste voorkennis

BSc in Biology, Ecology, Biomedical Sciences, Health Sciences, Earth Sciences, Chemistry or related fields

Aanbevolen voorkennis

BSc course in Environmental Toxicology (e.g. AB_1020) is recommended but not mandatory.

Doelgroep

Open to all MSc students in Biology, Ecology, Biomedical Sciences, Health Sciences, Earth Sciences, Chemistry or related fields. Compulsory course for MSc Ecology, ECT specialization. Optional course for UvA MSc Biology, L&O track.

Overige informatie

For more information, please contact: Dr. Timo Hamers, Room A-667, 020-598 9529, timo.hamers@vu.nl

Lecturers:

Dr. Timo Hamers
Dr. Jessica Legradi
Dr. Michiel Kraak (UvA)

Environmental and Human Toxicology

Vakcode	AM_1184 ()
Periode	Periode 1
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Lesmethode(n)	Hoorcollege, Computerpracticum
Niveau	400

Environmental Chemistry

Vakcode	XMU_437004 (437004)
Periode	Periode 1
Credits	6.0
Voertaal	Engels
Faculteit	Faculteit der Exacte Wetenschappen
Niveau	400

Inhoud vak

<http://studiegids.uva.nl/xmlpages/page/2016-2017/zoek-vak>

Overige informatie

This course is offered at the UvA. For more information contact: FNWI Education Service Centre, Science Park 904, servicedesk-esc-science@uva.nl, +31 (0)20 525 7100. Enrolment via <https://m.sis.uva.nl/vakaanmelden> is required. For courses taught in period 1 and period 2, enrolment via <https://datanose.nl/#speciaalenrol> is required.

Environmental Genomics and Adaptation

Vakcode	AM_470506 ()
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. ir. T.F.M. Roelofs
Examinator	dr. ir. T.F.M. Roelofs
Docent(en)	dr. ir. T.F.M. Roelofs
Lesmethode(n)	Hoorcollege, Computerpracticum, Practicum, Werkgroep, Werkcollege
Niveau	500

Doel vak

Students will be able to:

- 1 Describe different molecular genetic techniques to study gene expression and genomic variation in response to environmental stimuli.
- 2 Explain how to use these techniques in ecological and physiological research.
- 3 Analyze experimental data generated by genomics research and knowing the possibilities for follow-up research
- 4 Find and analyze genomic data in databases on internet.
- 5 Describe the functional significance of genomic variation for organisms and populations in natural environments.
- 6 Characterize the evolutionary consequences of such variation for species abundance, community diversity, and the evolution of speciation

Inhoud vak

Researchers in ecology and physiology are making extensive use of molecular techniques. Environmental genomics can be applied to advance our understanding of the way organisms functionally respond to changes within their local environment. Such responses may have consequences for species abundance, community diversity, and the evolution of speciation. In this course we will focus on:

Regulation of gene expression. Which genes are turned on in response to environmental challenge, and what do they do?

Differences in the molecular basis of fitness among individuals. Is there intraspecific variation in gene expression in response to environmental change, and is this variation adaptive?

Furthermore, we will assess evolutionary consequences of genomic variation. What are the ecosystem-, community-, and population-level consequences of the molecular transformations in the genome? Does gene family expansion and contraction drive speciation, or does the emergence of new gene bodies and protein domains add to speciation?

We will follow topics covered by chapters in the book `An

Introduction to Ecological Genomics' and include molecular adaptation to drought, genetic marker development and analytical methods, evolution of metal tolerance, speciation genetics.

Practical training include a Gene expression experiment, designed and executed by the students. Also, a computer exercise on transcriptomics (microarray data) will be performed. These data are extracted from peer-reviewed scientific papers. Finally, a journal club will be organized, in which students present a scientific paper on an Ecological Genomics topic.

The field of ecological genomics moves extremely quickly. Consequently, topics addressed in the accompanying book will be out of date to some extent. In order to address up-to-date and state-of-art knowledge on ecological genomics topics, specialists in this field will be invited to give guest lectures.

Onderwijsvorm

Lectures & Guest Lectures

Seminar (journal club) discussing recent literature on Environmental genomics. Presentation of a scientific paper during this seminar.

Written report summarizing the content of the presented scientific paper.

Practical training regarding gene expression analysis using Q-PCR technology.

Written report of Practical: Introduction, Material & Methods, Results and Discussion.

Computer exercise on transcriptomic data retrieved from public databases. The Limma package in R will be used predominantly. TIGR Mev software will be applied to visualize data output.

Self study

Toetsvorm

Pres: Assessment of oral presentation of a research paper by a panel consisting of course coordinator, junior lecturer and Post-doc.

Standardized forms will be used to retrieve scores for different aspects of the presentation.

Verslag: Assessment of written reports on QPCR practical and scientific paper

Mean grade of presentation and written reports will make up 30% of the final grade; presentation can be compensated with written report and visa versa.

Tentamen: Written exam consisting of open questions will make up 70% of final grade. A score of at least 5.5 for the written exam is required to pass this course.

Literatuur

N. M. van Straalen and D. Roelofs 2011. An Introduction to Ecological Genomics, 2nd edition. Oxford University Press.

Vereiste voorkennis

BSc level course on molecular biology, such as BSc course on Evolutionary Genetics (AB_1022) or Developmental Biology (AM_470613)

Doelgroep

MSc students Biology and Ecology from VU and UvA

Intekenprocedure

Standard via VUnet

Environmental Measuring Techniques

Vakcode	AMU_0005 ()
Periode	Periode 4
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen

Inhoud vak

<http://studiegids.uva.nl/xmlpages/page/2016-2017/zoek-vak/vak/25324>

Ethics in Life Sciences

Vakcode	AM_470707 ()
Periode	Periode 3
Credits	3.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	prof. dr. J.T. de Cock Buning
Examinator	prof. dr. J.T. de Cock Buning
Docent(en)	prof. dr. J.T. de Cock Buning, dr. J.F.H. Kupper, P. Klaassen MA
Lesmethode(n)	Hoorcollege, Werkgroep
Niveau	400

Doel vak

To provide a toolbox of ethical instruments to analyze properly moral problems related (to one's own) research in the life sciences and beyond

- To acquire conceptual knowledge of the central concepts in applied philosophy and professional ethics

- To be able to execute an ethical reflection on issues related to one owns life science

specialization and to open it for an impartial and constructive discussion

- To conduct, as a team based project, 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

. To show a respectful and accountable attitude in dealing with group dynamics during the work groups and project.

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 group training project, an ethical dialogue is prepared and executed in confrontation with another team.

Onderwijsvorm

Ethics in the Life Sciences is a fulltime course of four weeks (3 ECTS).

The total study time is 80 hours.

The different elements have the following study time:

- Lectures: 13 hours
 - Work groups: 17 hours
 - Group assignment: 24 hours
 - Exam: 2 hour
 - Moral dialogue: 4 hours
 - Self working (reading in the first week): 20 hours
- Please note that attendance to the work group meetings is compulsory. Attendance to the lectures is highly recommended. In our experience, relying on self-study alone is insufficient to apply the theory of the lectures in the assignments of the workgroups, and to pass the exam.

Toetsvorm

- Degree of intellectual participation in the workgroups (10%)
 - exam (50%)
 - written and verbal execution of the ethical dialogue (40%)
- All three elements have to be passed

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 and Neuro Sciences

Overige informatie

Lectures in English, Most of the work groups are in Dutch. Non Dutch speaking students will be placed in English work groups. All presentations and plenary discussions in English.

In order to maximize the experience of differences in values and preferences, and to increase meaningful ethical inquiry we will place you randomly in the workgroups. Placement will be communicated after the introduction lecture.

Evolution of Species Interaction

Vakcode	AMU_0006 ()
Periode	Periode 2
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. ir. T.F.M. Roelofs
Examinator	dr. ir. T.F.M. Roelofs

Inhoud vak

<http://studiegids.uva.nl/xmlpages/page/2016-2017/zoek-vak/vak/25495>

Intekenprocedure

Information about procedures can be found at <http://www.student.uva.nl/bs/az/item/course-registration.html>.

Experimental Design and Analysis

Vakcode	AM_470505 ()
Periode	Periode 2
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. J.T. Weedon
Examinator	dr. J.T. Weedon
Docent(en)	J. Duivenvoorden, dr. J.T. Weedon
Lesmethode(n)	Hoorcollege, Computerpracticum
Niveau	500

Doel vak

The final attainment levels of this course, include that students:

- Are acquainted with possible experimental designs for ecological research and can select the most suitable design depending on experimental objectives and hypotheses
- 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 combining empirical data with statistical models

Inhoud vak

A proper experimental design combined with a suitable statistical analysis is essential to -biological- 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 a range of statistical techniques independently. The application and implementation of the techniques (using the statistical programming language R) 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 such as unconstrained and constrained ordination are dealt with.

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 will be discussed. A specific case study is used to illustrate 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 subsequent assignments. The course is finalised with an extensive case study, to which the theory is applied. Knowledge of some of the main principles of applied statistics is also tested in a short-answer quiz. This set-up translates into 30 contact hours for lectures, 15 contact hours for practicals and 20 contact hours

for feedback on the assignments .

Toetsvorm

Quiz (30%)

Report on the final case study (70%)

Literatuur

There is no required textbook, however students are strongly recommended to have access to one of:

Quinn, G.P. and M.J. Keough (2002), *Experimental design and data analysis for biologists* Cambridge University Press

Discovering Statistics Using R (2012) A. Field, J. Miles & Z. Field SAGE Publications

The latter is particularly recommended for students without any previous experience with the R programming language.

In addition the following articles and books may be helpful for parts of the course:

Dalgaard, P. (2008) *Introductory Statistics with R*

Logan, M. (2010) *Biostatistical Design and Analysis Using R: A Practical Guide*. Wiley

Borcard, D., F. Gillet and P. Legendre (2011) *Numerical ecology in R*. Springer

Bolker, B.M., M.E. Brooks, C.J. Clark, S.W. Geange, J.R. Poulsen, M.H.H. Stevens and J.S. White (2009). Generalized linear mixed models: a practical guide for ecology and evolution. *Trends Ecol. Evol.* 24: 127-135

Gurevitch, J. and L.V. Hedges (1999) Statistical issues in ecological meta-analyses. *Ecology* 80: 1142-1149

This literature is complemented by lecture handouts, explanations of the assignments, answers to the assignments, and additional notes provided on Blackboard.

Vereiste voorkennis

Methodology and statistics 1 and 2 or equivalent statistics courses.

This implies that we require students to understand the interpretation of P-values, type I and type II errors and statistical hypotheses testing in general. In addition, students are required to have understanding on t-tests (paired and unpaired), linear regression and one-way ANOVAs.

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.

Lecturers:

dr. J.T. Weedon,
dr. J. Duivenvoorden,
dr. M. Egas

Literature Survey Ecology and Evolution

Vakcode	AM_1131 ()
Periode	Ac. Jaar (september)
Credits	12.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. J.T. Weedon
Examinator	dr. J.T. Weedon

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 aim is to demonstrate the ability to efficiently process material in a given field and to evaluate this critically in order to answer research questions at a more overarching level.

IMPORTANT: A extensive manual containing the forms and a description of all procedures and requirements of the literature thesis Ecology and Evolution can be found on:

<http://tinyurl.com/hvo9u4a>

Inhoud vak

The literature survey can focus on a fundamental ecological question but may also take a more applied ecological approach. The topic and research question are free of choice.

Prior to participating in any thesis or literature survey, both student and faculty staff member and external supervisor (if applicable) involved should fill

out a written application and agreement form.

This form (and others) can also be downloaded from:

<http://tinyurl.com/hvo9u4a>

Onderwijsvorm

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 and/or external supervisor.

Consult the manual for the literature survey for further details concerning writing of the proposal and the thesis.

Toetsvorm

At the end of the literature survey the student gives an oral presentation of the work in the Department of Ecology. The work and presentation will be assessed by the VU supervisor in consultation with the external supervisor, if applicable.

Literature theses will be assessed according to the following categories:

- A. Execution (25%)
- B. Thesis (50%)
- C. Oral Presentation (25%)

Literatuur

Selected papers

Doelgroep

Students in MSc Ecology specialization Ecology and Evolution

Overige informatie

In order to successfully start up and complete the literature thesis it is of major importance to read carefully the manual on:

<http://tinyurl.com/hvo9u4a>

Literature Survey Environmental Chemistry and Toxicology

Vakcode	AM_1132 ()
Periode	Ac. Jaar (september)
Credits	12.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. M.H. Lamoree
Examinator	dr. M.H. Lamoree

Doel vak

For master students in Environmental Chemistry and Toxicology, it is required to carry out a thesis based on a literature survey (12 ec). The aim is to demonstrate the ability to efficiently process material in a given field and evaluate this critically.

IMPORTANT: A extensive manual containing the forms and a description of all procedures and requirements of the literature thesis in the MSc

Ecology programme can be found on:

<http://www.falw.vu.nl/nl/onderzoek/ecological-sciences/internships-at-the-institute/index.asp>

Inhoud vak

The literature survey can focus on a fundamental question in environmental chemistry and/or environmental toxicology but may also take a more applied approach. The topic and research question are free of choice, but should be discussed before starting with the programme coordinator (see below).

Prior to participating in any thesis or literature survey, both student and faculty staff member and external supervisor (if applicable) involved should fill out a written application and agreement form.

This form (and others) can also be downloaded from:
<http://www.falw.vu.nl/nl/onderzoek/ecological-sciences/internships-at-the-institute/index.asp>

Onderwijsvorm

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 and/or

external supervisor.

Consult the manual for the literature survey for further details concerning writing of the proposal and the thesis.

Toetsvorm

At the end of the literature survey the student gives an oral presentation of the work at the Institute for Environmental Studies. The work and presentation will be assessed by the VU supervisor in consultation with the external supervisor, if applicable.

Literature theses will be assessed according to the following categories:

- A. Execution (25%)
- B. Thesis (50%)
- C. Oral Presentation (25%)

Literatuur

Selected papers

Doelgroep

Students in MSc Ecology specialization Environmental Chemistry and Toxicology

Intekenprocedure

In order to successfully start up and complete the literature thesis it is of major importance to read carefully the manual at:

<http://www.falw.vu.nl/nl/onderzoek/ecological-sciences/internships-at-the-institute/index.asp>

Overige informatie

For more information, contact the MSc Ecology - ECT coordinator dr. M. Lamoree, tel 020 5989573, marja.lamoree@vu.nl

Mass Spectrometry

Vakcode	X_435604 (435604)
Periode	Periode 2
Credits	6.0
Voertaal	Engels
Faculteit	Faculteit der Exacte Wetenschappen
Niveau	400

Inhoud vak

<http://studiegids.uva.nl/xmlpages/page/2016-2017/zoek-vak>

Overige informatie

This course is offered at the UvA. For more information contact: FNWI Education Service Centre, Science Park 904, servicedesk-esc-science@uva.nl, +31 (0)20 525 7100. Enrolment via <https://m.sis.uva.nl/vakaanmelden> is required. For courses taught in period 1 and period 2, enrolment via <https://datanose.nl/#specialenrol> is required.

Masterclasses in Ecology and Evolution

Vakcode	AM_1016 ()
Periode	Ac. Jaar (september)
Credits	3.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	prof. dr. J. Ellers
Examinator	prof. dr. J. Ellers
Docent(en)	prof. dr. J. Ellers
Lesmethode(n)	Hoorcollege, Werkcollege
Niveau	400

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. The total number of contact hours (including lectures and discussions) is 30, the remaining time is spent on preparation.

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.

Overige informatie

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

Microbial Ecology

Vakcode	AMU_0008 ()
Periode	Periode 1
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen

Inhoud vak

<http://studiegids.uva.nl/xmlpages/page/2015-2016/zoek-vak/vak/14424>

Intekenprocedure

This course is offered at the UvA. For more information contact: FNWI Education Service Centre, Science Park 904,

servicedesk-esc-science@uva.nl, +31 (0)20 525 7100.

Enrolment via <https://m.sis.uva.nl/vakaanmelden> is required.

Research Project Ecology and Evolution 1

Vakcode	AM_1100 ()
Periode	Ac. Jaar (september)
Credits	30.0
Voertaal	Engels

Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. J.T. Weedon
Examinator	dr. J.T. Weedon
Niveau	600

Doel vak

The aims of the master's placement are:

- The student learns to independently conduct scientific research.
- The student is able to independently find scientific information and to evaluate this for the benefit of his or her own research question.
- The student is able to apply scientific methods and knowledge, to answer research questions and to generate evidencebased knowledge.
- The student is able to formulate a research question, to choose, to implement and to evaluate the (appropriate) research method, and to phrase the obtained results in a scientific report.
- The student is able to cooperate with researchers of various disciplines.
- The student is able to write a scientific report of the research on the level of peer-reviewed academic journals.
- The student is able to orally present the research results and to discuss the findings.
- The student obtains a good impression of a potential future field of career.

Inhoud vak

The two research projects in the Ecology and Evolution programme serve to get students acquainted and experienced with the practice of ecological research. Both research projects should thus reside in Ecology. If you have 12 ec in elective courses in your programme both research projects together will have to amount up to 78 ec. If you have 18 ec in elective courses the total study load is 72 ec. The shortest project should at least be 30 ec.

The first research project during your MSc Ecology and Evolution must take place at the Department of Ecological Science at the VU, or at the Institute for Biodiversity and Ecosystem Dynamics at the UvA.

For research projects at the Ecology department of the VU check the website:

<http://tinyurl.com/hvo9u4a>

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), 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 can also be 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 are not of a masters' level and will not be approved.

Each project starts with writing a research proposal. Consult the Placement Manual for guidelines.

Onderwijsvorm

A Placement Manual for Research Projects in the MSc Ecology can be obtained at:
<http://tinyurl.com/hvo9u4a>

This document contains the protocols, guidelines for proposals and reports and application and assessment forms, etc. needed to successfully complete a research project.

IT IS VERY IMPORTANT to read this document carefully in order to avoid unpleasant experiences during the progress of the placement. Every research project or literature study has to be approved by the master coordinator in advance.

Toetsvorm

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. The final grade will be determined by the VU supervisor and VU second assessor in consultation with the external supervisor, if applicable. It is based on the following categories: attitude (pass/fail), execution (20%), presentation (20%) and report (60%).

Literatuur

Selected papers

Vereiste voorkennis

You are not allowed to start a research project before having obtained already 18 ec in master courses.

Doelgroep

MSc Ecology specialization Ecology and Evolution

Intekenprocedure

See placement manual at:
<http://tinyurl.com/hvo9u4a>

Overige informatie

The Placement Manual for Research Projects in the MSc Ecology can be obtained at:
<http://tinyurl.com/hvo9u4a>

Research Project Ecology and Evolution II

Vakcode	AM_1114 ()
Periode	Ac. Jaar (september)
Credits	30.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. J.T. Weedon

Examinator	dr. J.T. Weedon
Niveau	600

Doel vak

The aims of the master's placement are:

- The student learns to independently conduct scientific research.
- The student is able to independently find scientific information and to evaluate this for the benefit of his or her own research question.
- The student is able to apply scientific methods and knowledge, to answer research questions and to generate evidencebased knowledge.
- The student is able to formulate a research question, to choose, to implement and to evaluate the (appropriate) research method, and to phrase the obtained results in a scientific report.
- The student is able to cooperate with researchers of various disciplines.
- The student is able to write a scientific report of the research on the level of peer-reviewed academic journals.
- The student is able to orally present the research results and to discuss the findings.
- The student obtains a good impression of a potential future field of career.

Inhoud vak

The two research projects in the Ecology and Evolution programme serve to get students acquainted and experienced with the practice of ecological research. Both research projects should thus reside in Ecology. If you have 12 ec in elective courses in your programme both research projects together will have to amount up to 78 ec. If you have 18 ec in elective courses the total study load is 72 ec. The shortest project should at least be 30 ec.

The first research project during your MSc Ecology and Evolution must take place at the Department of Ecological Science at the VU, or at the Institute for Biodiversity and Ecosystem Dynamics at the UvA.

For research projects at the Ecology department of the VU check the website:

<http://tinyurl.com/hvo9u4a>

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), 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 can also be 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 are not of a masters' level and will not be approved.

Each project starts with writing a research proposal. Consult the Placement Manual for guidelines.

Onderwijsvorm

A Placement Manual for Research Projects in the MSc Ecology can be obtained at:

<http://tinyurl.com/hvo9u4a>

This document contains the protocols, guidelines for proposals and reports and application and assessment forms, etc. needed to successfully complete a research project.

IT IS VERY IMPORTANT to read this document carefully in order to avoid unpleasant experiences during the progress of the placement. Every research project or literature study has to be approved by the master coordinator in advance.

Toetsvorm

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. The final grade will be determined by the VU supervisor and VU second assessor in consultation with the external supervisor, if applicable. It is based on the following categories: attitude (pass/fail), execution (20%), presentation (20%) and report (60%).

Literatuur

Selected papers

Vereiste voorkennis

You are not allowed to start a research project before having obtained already 18 ec in master courses.

Doelgroep

MSc Ecology specialization Ecology and Evolution

Intekenprocedure

See Placement Manual at:

<http://tinyurl.com/hvo9u4a>

Overige informatie

The Placement Manual for Research Projects in the MSc Ecology can be obtained at:

<http://tinyurl.com/hvo9u4a>

Research Project Environmental Chemistry and Toxicology I

Vakcode	AM_1108 ()
Periode	Ac. Jaar (september)
Credits	30.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. M.H. Lamoree
Examinator	dr. M.H. Lamoree
Niveau	600

Doel vak

The aims of the master's placement are:

- The student learns to independently conduct scientific research.
- The student is able to independently find scientific information and to evaluate this for the benefit of his or her own research question.
- The student is able to apply scientific methods and knowledge, to answer research questions and to generate evidencebased knowledge.
- The student is able to formulate a research question, to choose, to implement and to evaluate the (appropriate) research method, and to phrase the obtained results in a scientific report.
- The student is able to cooperate with researchers of various disciplines.
- The student is able to write a scientific report of the research on the level of peer-reviewed academic journals.
- The student is able to orally present the research results and to discuss the findings.
- The student obtains a good impression of a potential future field of career.

Inhoud vak

The two research projects in the MSc Environmental Chemistry and Toxicology specialization serve to get students acquainted and experienced with the practice of research in environmental chemistry and environmental toxicology. Students are required to do one research project in environmental chemistry (AM_1108), and one in environmental toxicology (AM_1113). Each research projects is 30 Ec. One of the projects may be extended by 6 Ec by substituting an elective course. The first research project during your MSc Ecology – ECT must take place at the Institute for Environmental Studies or Department of Ecological Sciences at the VU, or at the Institute for Biodiversity and Ecosystem Dynamics at the UvA.

For research projects at the VU, contact the coordinator or check the website:

www.falw.vu.nl/nl/onderzoek/ecological-sciences/internships-at-the-institute.

If you would like to do a project outside the VU you may look for internships at the websites of other Dutch universities or research institutes, for example: KWR or Waternet (applied water research), NIOO (fundamental ecological research), NIOZ (marine ecology), IMARES (fisheries and sea research), ALTERRA (applied and environmental ecology), RIVM (applied and environmental ecology), Deltares (applied environmental sciences), but also at the sites of nature conservation organisations such as Natuurmonumenten, Staatsbosbeheer, or regional authorities (Provincie and Waterschap). Projects at universities or research institutes outside the Netherlands can also be accepted provided they are of sufficient academic quality.

In all cases: take care that you will be working on either an environmental chemistry or environmental toxicology 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

A Placement Manual for Research Projects in the MSc Ecology can be obtained from the master coordinator (g.j.j.driessen@vu.nl). This

document contains the protocols, guidelines for proposals and reports and application and assessment forms, etc. needed to successfully complete a research project. It is very important to read this document carefully in order to avoid unpleasant experiences during the progress of the placement. Every research project or literature study has to be approved by the master coordinator in advance.

Toetsvorm

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. The final grade will be based on the following categories: attitude (pass/fail), execution (20%), presentation (20%) and report (60%).

Vereiste voorkennis

You are not allowed to start a research project before having obtained already 18 ec in master courses.

Aanbevolen voorkennis

The MSc course Experimental Design and Analysis (AM_470505) is strongly recommended.

Doelgroep

MSc Ecology - ECT students

Overige informatie

For more information, please contact: dr. M. Lamoree, 020-5989573, marja.lamoree@vu.nl.

Research Project Environmental Chemistry and Toxicology II

Vakcode	AM_1113 ()
Periode	Ac. Jaar (september)
Credits	30.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. M.H. Lamoree
Examinator	dr. M.H. Lamoree
Niveau	600

Doel vak

The aims of the master's placement are:

- The student learns to independently conduct scientific research.
- The student is able to independently find scientific information and to evaluate this for the benefit of his or her own research question.
- The student is able to apply scientific methods and knowledge, to answer research questions and to generate evidencebased knowledge.
- The student is able to formulate a research question, to choose, to implement and to evaluate the (appropriate) research method, and to phrase the obtained results in a scientific report.
- The student is able to cooperate with researchers of various disciplines.
- The student is able to write a scientific report of the research on the level of peer-reviewed academic journals.
- The student is able to orally present the research results and to

discuss the findings.

- The student obtains a good impression of a potential future field of career.

Inhoud vak

The two research projects in the MSc Environmental Chemistry and Toxicology specialization serve to get students acquainted and experienced with the practice of research in environmental chemistry and environmental toxicology. Students are required to do one research project in environmental chemistry (AM_1108), and one in environmental toxicology (AM_1113). Each research project is 30 Ec. One of the projects may be extended by 6 Ec by substituting an elective course.

The first research project during your MSc Ecology – ECT must take place at the Institute for Environmental Studies or Department of Ecological Sciences at the VU, or at the Institute for Biodiversity and Ecosystem Dynamics at the UvA.

For research projects at the VU, contact the coordinator or check the website:

www.falw.vu.nl/nl/onderzoek/ecological-sciences/internships-at-the-institute.

If you would like to do a project outside the VU you may look for internships at the websites of other Dutch universities or research institutes, for example: KWR or Waternet (applied water research), NIOO (fundamental ecological research), NIOZ (marine ecology), IMARES (fisheries and sea research), ALTERRA (applied and environmental ecology), RIVM (applied and environmental ecology), Deltares (applied environmental sciences), but also at the sites of nature conservation organisations such as Natuurmonumenten, Staatsbosbeheer, or regional authorities (Provincie and Waterschap). Projects at universities or research institutes outside the Netherlands can also be accepted provided they are of sufficient academic quality.

In all cases: take care that you will be working on either an environmental chemistry or environmental toxicology 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

A Placement Manual for Research Projects in the MSc Ecology can be obtained from the master coordinator (g.j.j.driessen@vu.nl). This document contains the protocols, guidelines for proposals and reports and application and assessment forms, etc. needed to successfully complete a research project. It is very important to read this document carefully in order to avoid unpleasant experiences during the progress of the placement. Every research project or literature study has to be approved by the master coordinator in advance.

Toetsvorm

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. The final grade will be based on the following categories: attitude (pass/fail), execution (20%), presentation (20%) and report (60%).

Vereiste voorkennis

You are not allowed to start a research project before having obtained already 18 ec in master courses.

Aanbevolen voorkennis

The MSc course Experimental Design and Analysis (AM_470505) is strongly recommended.

Doelgroep

MSc Ecology - ECT students

Overige informatie

For more information, please contact: dr. M. Lamoree, tel. 020-5989573,

marja.lamoree@vu.nl

Scientific Writing in English (AM_ECOL)

Vakcode	AM_1157 ()
Periode	Periode 4
Credits	3.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	M. van den Hoorn
Examinator	M. van den Hoorn
Lesmethode(n)	Werkgroep
Niveau	400

Doel vak

The aim of this course is to provide Master's students with the essential linguistic know-how for writing a scientific article in English that is well organized, idiomatically and stylistically appropriate and grammatically correct.

At the end of the course students

- know how to structure a scientific article;
- know what the information elements are in parts of their scientific article;
- know how to produce clear and well-structured texts on complex subjects;
- know how to cite sources effectively;
- know how to write well-structured and coherent paragraphs;
- know how to construct effective sentences;
- know what collocations are and how to use them appropriately;
- know how to adopt the right style (formal style, cohesive style, conciseness, hedging)
- know how to avoid the pitfalls of English grammar;
- know how to use punctuation marks correctly;
- know what their own strengths and weaknesses are in writing;
- know how to give effective peer feedback.

Final texts may contain occasional spelling, grammatical or word choice errors, but these will not distract from the general effectiveness of the text.

Inhoud vak

The course will start with a general introduction to scientific writing in English. Taking a top-down approach, we will then analyse the structure of a scientific article in more detail. As we examine each section of an article, we will peel back the layers and discover how paragraphs are structured, what tools are available to ensure coherence

within and among paragraphs, how to write effective and grammatically correct sentences and how to choose words carefully and use them effectively.

Topics addressed during the course include the following:

- Structuring a scientific article
- Considering reading strategies: who is your readership? How do they read your text? What do they expect? How does that affect your writing?
- Writing well-structured and coherent paragraphs
- Composing effective sentences (sophisticated word order, information distribution).
- Arguing convincingly – avoiding logical fallacies
- Academic tone and style: hedging – why, how, where?
- Using the passive effectively
- Understanding grammar (tenses, word order, etc.)
- Understanding punctuation
- Referring to sources: summarising, paraphrasing, quoting (how and when?)
- Avoiding plagiarism
- Vocabulary development: using appropriate vocabulary and collocations

Onderwijsvorm

Scientific Writing in English is an eight-week course and consists of 2 contact hours a week. Students are required to spend at least 6 to 8 hours of homework per week. They will work through a phased series of exercises that conclude with the requirement to write several text parts (Introduction, Methods or Results section, Discussion and Abstract). Feedback on the writing assignments is given by the course teacher and by peers.

Toetsvorm

Students will receive the three course credits when they meet the following requirements:

- Students hand in three writing assignments (Introduction, Methods, Discussion)
- Students get a pass mark for all writing assignments;
- Students provide elaborate peer feedback (Introduction, Methods, Discussion, Abstract);
- Students attend at least 7 out of 8 sessions;
- Students are well prepared for each session (i.e. do all homework assignments);
- Students participate actively in class;
- Students do not plagiarise or self-plagiarise.

Writing assignments:

1. If students have a BSc thesis in a traditional thesis form (e.g., 20+ pages) and written in English, they may use this for the writing assignments.
2. If students have a BSc thesis in a traditional form (e.g., 20+ pages) written in another language than English, they may use this for the writing assignments.
3. If students have written a paper or report in English that's not already in article form, they may use this for the writing assignment.
4. If students are working on their MSc thesis or internship report when taking Scientific Writing in English, they may use this for the writing assignments. They will have to notify their supervisor to make sure that they won't be accused of self-plagiarism.
5. If students cannot or do not wish to use any of the above-mentioned texts for the writing assignments (1-4), they are

expected to do a limited Literature Review on a topic in their field of research, using at least 5 articles.

Students are not allowed to use the following texts for the writing assignments:

1. A BSc thesis written in English that's already in article form.
2. A MSc thesis written in English that's already in article form (and that has already been marked).
3. An internship report written in English that's already in article form (and that has already been marked).
4. A paper or report written in English that's already in article form.

Literatuur

Effective Scientific Writing: An Advanced Learner's guide to Better English, 4th edition (February 2016) (A. Bolt & W. Bruins, ISBN 978 90 8659 617 1). VU bookstore: €27.95.

Doelgroep

This course is only open to students of the two-year Master's programmes of the Faculty of Earth and Life Sciences. These students are only eligible to the course if they have already conducted scientific research (e.g. for their Bachelor's thesis) or if they will be working on a research project when taking Scientific Writing in English.

Overige informatie

- To do well, students are expected to attend all lessons. Group schedules are to be found at rooster.vu.nl and on 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 offering this course; groups assigned to specific studies: registration through programme and course coordinator).
- Make sure Scientific Writing in English does not overlap with another course.
- If you have registered for a group in Blackboard, you are expected to attend all sessions (eight). If you decide to withdraw from the course, do so in time in VUnet. This 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.
- For specific Blackboard matters concerning this course, please contact blackboard.beta@vu.nl.
- Full time students with their main registration at VU will be given preferential treatment for placement in this course. For secondary students proof of enrollment is not a guarantee of placement.

Separation Sciences

Vakcode	X_435609 (435609)
Periode	Periode 1
Credits	6.0
Voertaal	Engels
Faculteit	Faculteit der Exacte Wetenschappen
Coördinator	dr. H. Lingeman
Examinator	dr. H. Lingeman
Docent(en)	dr. H. Lingeman

Lesmethode(n)	Hoorcollege
Niveau	400

Inhoud vak

<http://studiegids.uva.nl/xmlpages/page/2016-2017/zoek-vak>

Overige informatie

This course is offered at the UvA. For more information contact: FNWI Education Service Centre, Science Park 904, servicedesk-esc-science@uva.nl, +31 (0)20 525 7100. Enrolment via <https://m.sis.uva.nl/vakaanmelden> is required. For courses taught in period 1 and period 2, enrolment via <https://datanose.nl/#specialenrol> is required.

Soil-Plant-Animal Interactions

Vakcode	AM_470507 ()
Periode	Periode 1
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	prof. dr. M.P. Berg
Examinator	prof. dr. M.P. Berg
Docent(en)	ing. R.S.P. van Logtestijn, prof. dr. J.H.C. Cornelissen, prof. dr. M.P. Berg
Lesmethode(n)	Hoorcollege, Practicum, Werkgroep, Excursie, Veldwerk
Niveau	500

Doel vak

Students will be able to:

- Underpin the importance of ecological interactions (trophic and non-trophic) between soil organisms-plants-aboveground fauna (and vice versa)
- Critically evaluate and investigate the relevant interactions between soil-soil organisms, soil-vegetation, soil organisms-vegetation, vegetation-herbivores (and vice versa)
- Critically evaluate and investigate the relevant functional traits that underlie ecological interactions between the soil-subsystem (brown web) and plant-subsystem (green web)
- In the field: apply different techniques to survey the soil-subsystem and plant-subsystem, and to sample soil and soil organisms
- In the laboratory: carry out ecological and biochemical analyses relevant to brown-green web interactions, with emphasis on organismal traits.

Inhoud vak

A hot theoretical topic in Ecology concerns the interdependency of the brown web (belowground) and green web (aboveground) compartments. This comprises key conceptual issues relating to interactions between brown and green communities, the importance of functional traits to understand these interactions within and between these communities, 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 and climate change.

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

- The brown and green food web: biotic interactions and regulators
- Plant species and plant trait control of brown web interactions and processes
- Belowground consequences of green food web interactions
- Completing the circle: how brown 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 Zevenaar, The Netherlands) where brown-green web interactions in subarctic ecosystems are currently being studied, with emphasis on (a) design and statistical treatment of experiments on soil-plant-fauna interactions, (b) techniques to identify soil organisms and analyse soil processes, biochemistry and vegetation development.

Onderwijsvorm

Lectures (9 hours) on important theoretical concepts underlying soil, plant, animal interactions.

Fieldwork (4 days) to test hypotheses of own research project

Laboratory work (6 days) to analyse samples of own research project and to prepare presentation

Toetsvorm

- Individual performance in critical group discussions about important theory based on research papers/chapters
- A preliminary presentation about the own research project, especially on research aim and method to test hypothesis
- A final presentation about background, design and (synthesis of) results of own research project.

Literatuur

Selected literature will be made available via BB, which includes recent key papers in international journals and extracts from the book of Richard D.

Bardgett and David A. Wardle (2010): "Aboveground-Belowground Linkages; Biotic interactions, ecosystem processes, and global change". Oxford Series in Ecology and Evolution.

Vereiste voorkennis

To attend this course there will be costs involved. A part of the expenses for accommodation at Zevenaar have to be covered by the MSc-students themselves.

Doelgroep

MSc students with focus on ecology.

Intekenprocedure

Fieldwork costs have to be contributed in advance. Details will be announced via Blackboard

Overige informatie

Lecturers:

prof. dr. M.P. Berg,
prof. dr. J.H.C. Cornelissen,
prof. dr. Andre de Roos,
dr. I. Smallegange,
ing. R.S.P. van Logtestijn.

Spatial Processes in Ecology

Vakcode	AMU_0009 ()
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen

Inhoud vak

This is an UvA course. For the course description, please visit

<http://studiegids.uva.nl/>

Value of Ecosystem Services

Vakcode	AM_468024 ()
Periode	Periode 1
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. P.J.H. van Beukering
Examinator	dr. P.J.H. van Beukering
Docent(en)	dr. P.J.H. van Beukering
Lesmethode(n)	Hoorcollege, Excursie
Niveau	400

Doel vak

One of the hot topics in environmental management today is the concept of "ecosystem services". This concept can be defined as the benefits that people obtain from ecosystems. Important ecosystem services are food, fuel, timber and water provision, carbon storage and sequestration, soil formation, climate and disease regulation, aesthetic benefits and spiritual values. By putting ecosystem services central in the debate on nature conservation, the societal benefits of nature conservation and the need to align conservation and development goals are stressed. Quantification and apportionment of ecosystem services and biodiversity are major challenges. This course aims to assess the importance of ecosystem services and biodiversity for nature, the economy and people.

Inhoud vak

The course focuses on an understanding of what specific services are provided by ecosystems, how these are linked to biodiversity. It attempts to remain close to the practicality of quantification. It will then continue to address the economics of ecosystem services. Various ecosystems (e.g. forests, coral reefs, wetlands, rivers) and forms of biodiversity are covered (e.g. wildlife, flora). Next to main and guest lectures and debate, the course contains a six-week case study carried

out in groups of 3-4 students. The subjects addressed in this group assignment either come from real "clients" such as governmental and non-governmental organizations, or can also be developed by the students themselves. The main objective of the assignment is to apply the skills taught in the course in a real life example. More details of the assignment are provided below.

After having participated in this module, students should be able to answer the following questions:

1. How do ecosystems produce ecosystem services and how are ecosystems changing over time and space?
2. How does biodiversity relate to ecosystem services?
3. What services do ecosystems and biodiversity provide and how can these services be measured?
4. What is the social and economic importance of the ecosystem services and biodiversity and what drives these economic and cultural values?
5. What instruments are available to mobilize payments for ecosystem services necessary for sustainable management of ecosystems and biodiversity?
6. What is the role of ecosystem services in alleviating poverty?
7. How to conduct a rapid appraisal of ecosystem services taking into account the above-mentioned issues?

Onderwijsvorm

- A group case study presentation and a final report
- The course ends with a closed book exam
- The exam weighs 70%, the group assignment (presentation & final report) 30%
- Students must pass all (5.5 or higher)

Toetsvorm

A group case study presentation and a final paper;
The course ends with a closed book exam;
The exam weighs 70%, Assignment (presentation and paper) 30%.
Students must pass all (5.5 or higher).

Literatuur

The main written source is a book (i.e. Bouma and Van Beukering 2015) which is especially written for this specialization in Ecosystem Services.

Bouma, J. and P.J.H. van Beukering (2015). Ecosystem services: from concept to practice. Cambridge University Press. Cambridge.

In addition, several freely downloadable journal articles and papers are part of the reading material.

Vereiste voorkennis

Students do not require a specific disciplinary background, although affinity with ecology and economics is useful.

Doelgroep

Students with an interest in the link between the natural environment and society. This interest may vary widely, possibly including topics such as nature conservation, tourism, food production, poverty, international trade, education, and landscapes.

Overige informatie

The course is taught by Dr Pieter van Beukering and Prof Dr Peter Verburg (IVM-VU University)

Guest lectures are provided by:

- Dr Rudolf de Groot (Wageningen University)
- Dr Ben ten Brink (PBL, Netherlands)
- Dr Roel Sootweg (SEVS)
- Dr Mathew Parr (IUCN)
- Drs Emilie Reuchlin-Hugenholtz (WWF)