Biology MSc
Vrije Universiteit Amsterdam - Fac. der Aard- en Levenswetenschappen - M Biology - 2011-2012
The aim of the Master programme Biology is to provide the students with the knowledge, skills and insight required to operate as an independent professional within the field of biology and to be a suitable candidate for a subsequent course of study leading to a career in research.

A general programme will guarantee an elaborate research experience founded on a solid theoretical basis combined with communicative skills that are necessary to function on an international level. Students can choose from several specialisations:

- Ecology (research)
- Cell Biology (research)
- Brain and Behavior (research)
- Integrative Plant Sciences (research)
- Societal specialisation
- Communication specialisation
- Education specialisation (only in Dutch)

The Societal specialisation, the Communication specialisation and the Education specialisation are single year programmes that can not be combined with each other and must be combined with one of the research specialisations.

The year schedule 2011 - 2012 can be found at the FALW-website.
Further programme information can be found at the FALW-website.
A complete programme description can be found at the FALW-website.
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<td>Vak: Behavioral Genetics</td>
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<td>Vak: Cognition and Attention</td>
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<td>Vak: Developmental Biology</td>
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<td>Vak: Disability and Development</td>
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<td>Vak: Ecotoxicology and Environmental Quality</td>
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<td>Vak: Internship Ecology</td>
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<td>Vak: Molecular Infection Biology</td>
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<td>Vak: Soil Vegetation Atmosphere Exchange</td>
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<td>Vak: Soil-Plant Interactions</td>
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<td>Vak: Spatial Analysis for Ecologists</td>
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<td>Vak: Spatial Ecology and Global Change</td>
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<td>Vak: Sustainable Land Management</td>
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<td>Vak: System Neurosciences</td>
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</table>
Expired course modules FALW - master programmes

The course modules presented in the list below will no longer be offered in academic year 2011-2012. For some of these courses a final resit opportunity will be offered in academic year 2011-2012. These course modules are: (details will follow).

Courses:

<table>
<thead>
<tr>
<th>Name</th>
<th>Period</th>
<th>Credits</th>
<th>Code</th>
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<tbody>
<tr>
<td>Behavioral Genetics</td>
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<td>AM_470732</td>
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<td>Caput Community Genetics</td>
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<td>Clinical Neuroscience</td>
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<td>AM_470757</td>
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<tr>
<td>Cognition and Attention</td>
<td>Ac. Year (September)</td>
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<td>AM_470735</td>
</tr>
<tr>
<td>Community Genetics</td>
<td>Ac. Year (September)</td>
<td>6.0</td>
<td>AM_470812</td>
</tr>
<tr>
<td>Emotional and Cognitive Neuroscience</td>
<td>Ac. Year (September)</td>
<td>4.0</td>
<td>AM_470711</td>
</tr>
<tr>
<td>Experimental neurophysiology</td>
<td>Ac. Year (September)</td>
<td>6.0</td>
<td>AM_470714</td>
</tr>
<tr>
<td>Health Journalism</td>
<td>Ac. Year (September)</td>
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<td>AM_470824</td>
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<tr>
<td>Interactive communication</td>
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<td>AM_470562</td>
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<td>Interpersonal Communication</td>
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<td>AM_471007</td>
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<tr>
<td>Neurogenomics</td>
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<tr>
<td>Neuroinformatics</td>
<td>Ac. Year (September)</td>
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<td>AM_470724</td>
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<tr>
<td>Principles of Neuroscience</td>
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<td>Quantitative Methods in Neuroscience and Genetics</td>
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<td>5.0</td>
<td>AM_470731</td>
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<tr>
<td>Regional Hydrogeology and Groundwater Management</td>
<td>Ac. Year (September)</td>
<td>6.0</td>
<td>AM_450057</td>
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<tr>
<td>Soil Vegetation Atmosphere Exchange</td>
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<td>6.0</td>
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<tr>
<td>Sustainable Land Management</td>
<td>Ac. Year (September)</td>
<td>3.0</td>
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</tbody>
</table>

MSc Biology, Non-Research Specialisation Programmes

Opleidingsdelen:

- Communication Specialisation
- Education Specialisation
- Societal Specialisation
Communication Specialisation

This specialisation is intended for students with a BSc degree in any of the Bêta-studies who want to specialise in communication. The programme focuses on science communication theory, research and practice. The programme of the communication (C) specialisation is 1 year (54-57 credits). The specialisation must be combined with a specialisation in biological or biomedical research and may not be combined with the Societal specialisation or the Educational specialisation. C-courses are shared with master students of the School of Earth and Environmental Sciences, and of the Faculty of Exact Sciences.

The communication programme consists of 54-57 credits. Two courses (12 credits), one research project (21 credits) and a thesis (9 credits) are compulsory. The rest of the program can be filled in with optional courses (1-15 credits). You can do an internship at the department of Science Communication, another research institute, or at a radio station, a newspaper, a museum or another public communication institute, according to your personal interest. Please note that the extent of the internship or research project is 21 credits, which differs from the regular 30-36 credits for internships and research projects in the other specialisations within the Master's programme Biology. The thesis (9 credits) consists of a study of literature on an aspect of science communication. The course language is English, but the courses Interpersonal Communication, Science Journalism and Science Communication through Museums are taught in Dutch.

Programme components:

- Internship Science Communication
- Course modules Communication spec.

Students can opt for an internship of 30 credits (EC), or for a combination of an internship of 21 credits and a thesis of 9 credits.

Vakken:

<table>
<thead>
<tr>
<th>Naam</th>
<th>Periode</th>
<th>Credits</th>
<th>Code</th>
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<tbody>
<tr>
<td>Internship Communication</td>
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<td>Internship Communication</td>
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<tr>
<td>Specialisation</td>
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</table>

Students can opt for a selection of modules from this group. The following modules are compulsory: - Research Methods (AM_470582) - Science and Communication (AM_470587)

Vakken:
Education Specialisation

This specialisation provides training for the profession of teacher in Dutch VWO (higher secondary school) education. The programme of the Education specialisation is 1 year (60 credits). E-courses are shared with master students from the School of Earth and Environmental Sciences, and from the Faculty of Sciences. The specialisation must be combined with a research programme in biological research comprising at least 51 credits (courses, internship and literature study) and general compulsory courses (9 credits).

More information can be found on www.onderwijscentrum.vu.nl/lerarenopleiding (information in Dutch Language only).

Educational programme (eerstegraads lerarenopleiding)
The educational programme is taught in Dutch and consists of 60 credits of compulsory modules. The programme can be started twice a year, in September and February.

Courses:

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<td>Communication, Organization</td>
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<tr>
<td>and Management</td>
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<tr>
<td>Qualitative and Quantitative</td>
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<td>Research Methods</td>
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<tr>
<td>Science and Communication</td>
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<td>Science Communication</td>
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<td>Science Communication through</td>
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<td>Museums</td>
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<tr>
<td>Science in Dialogue</td>
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<tr>
<td>Science Journalism</td>
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Societal Specialisation

The Societal or M-specialisation is a specialisation in the field of policy, management and entrepreneurship on biological and medical issues. The programme of the Societal specialisation is 1 year (54-57 credits). The specialisation must be combined with a research programme in biological research comprising at least 54 credits (courses, internship and literature study) and general compulsory courses (9 credits).

The programme is equal to the first year of the Master programme Management, Policy Analysis and Entrepreneurship in Health and Life Health Sciences (MPA) (for a detailed description of the programme see the description of the Master programme MPA). The programme of the Societal specialisation consists of 18 credits compulsory courses, 30
credits internship and 6-9 credits optional courses.

Courses:

<table>
<thead>
<tr>
<th>Name</th>
<th>Period</th>
<th>Credits</th>
<th>Code</th>
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</thead>
<tbody>
<tr>
<td>Analysis of Governmental Policy</td>
<td>Period 1</td>
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<td>AM_470571</td>
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<tr>
<td>Business Management in Health and Life Sciences</td>
<td>Period 2</td>
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<tr>
<td>Clinical development and clinical trials</td>
<td>Period 3</td>
<td>6.0</td>
<td>AM_470585</td>
</tr>
<tr>
<td>Communication, Organization and Management</td>
<td>Period 2</td>
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<td>Disability and Development</td>
<td>Period 2</td>
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<td>AM_470588</td>
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<td>Entrepreneurship in Health and Life Sciences</td>
<td>Period 2</td>
<td>6.0</td>
<td>AM_470575</td>
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<tr>
<td>Health, Globalisation and Human Rights</td>
<td>Period 2</td>
<td>6.0</td>
<td>AM_470818</td>
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<tr>
<td>Internship Societal Specialisation</td>
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<td>Policy, Politics and Participation</td>
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<td>Qualitative and Quantitative Research Methods</td>
<td>Period 1</td>
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<td>Science in Dialogue</td>
<td>Period 2</td>
<td>6.0</td>
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</table>

MSc Biology, Research Specialisation Programmes

The prescribed scope of these research specialisations is a minimum of 54 credits and includes a research project (30 credits), and at least 3 course-based elements from the specialist area and an extra optional course (6 credits), or an extension of the research internship (6 credits) or a thesis based literature study in the field of the specialisation (9 credits). When a student selects one specialisation (18 credits) for the Masters programme, he/she has to include a literature thesis (9 credits) within this specialisation. When a student wishes to combine 2 specialisations, only one of the specialisation has to include a literature thesis (9 credits). When two specialisations are combined, each specialisation has a maximum of 18 credits of compulsory courses. The rest of the programme must fulfil the requirements as described.

Programme components:

- Specialisation Brain and Behaviour
- Specialisation Cell Biology
- Specialisation Ecology
- Specialisation Integrative Plant Sciences

Specialisation Brain and Behaviour
This specialisation is focused on the knowledge, insight and understanding of the multiple facets that play a role in various kinds of behavioral functions and how these are influenced by genes, environmental factors and developmental factors. Behavior models will be presented and discussed to demonstrate the significance of Brain and Behavior within the context of brain research and its clinical implications. Special attention is given to research issues in the mouse and in humans. The specialisation is intended for students of the Master's programme in Biology or Biomedical Sciences.

For a specialisation Brain and Behavior three courses (18 credits) plus one internship or research project (30 credits) are compulsory are obligatory plus an extra course, internship extension (6 credits) or literature study (together at least 54 credits). The remaining programme can be selected freely in accordance with the general requirements for an MSc in Biology or Biomedical Sciences. However, it is advised to focus in the direction of functional genomics and experimental physiology within the Institute of Neurosciences. In the research projects or internships students will focus on one or more specific aspects of Behavioral Neurosciences.

The specialised courses aim at providing the student with different topics that impact on brain and behavior. These courses are strongly interactive, take place in small groups and are characterised by covering topics in selected textbooks, important current research issues, methodological aspects, laboratory demonstrations and exercises.

Programme components:

- compulsory courses
- choose at least one of these courses

compulsory courses

<table>
<thead>
<tr>
<th>Naam</th>
<th>Periode</th>
<th>Credits</th>
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<td>Methods in Behavioral Neurosciences</td>
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<td>AM_470728</td>
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<td>Neurobiology of Animal Behaviour</td>
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choose at least one of these courses

Vakken:

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<th>Periode</th>
<th>Credits</th>
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</table>
Specialisation Cell Biology

This programme has been developed for master students with a Bachelors degree in Biology or Biomedical Sciences or any other relevant Bachelor's degree (for instance Biochemistry or HLO) who want to specialise in the field of Cell Biology. The programme is composed by the Institute for Molecular Cell Biology (IMC) of the Faculty of Earth and Life Sciences (FALW) in collaboration with the department of Molecular Cell Biology and Immunology of the VU Medical Center (VUmc).

For a specialisation degree 3 courses and one caput (see below) from the course programme plus one student research internship (30 credits) are obligatory (together at least 54 credits). The rest of the programme can be filled freely within the general requirements for an MSc Biomedical Sciences. The internship should be in the field of Cell Biology, preferably at the Institute for Molecular Cell Biology (IMC) of the Faculty of Earth and Life Sciences (FALW) or the department of Molecular Cell Biology and Immunology of the VU Medical Center (VUmc).

Programme components:

- Capita courses MSc Biology (elective)
- compulsory course
- choose at least 3 of these courses

Capita courses MSc Biology (elective)

Vakken:

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<tbody>
<tr>
<td>Caput Cellular Protein Trafficking</td>
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<tr>
<td>Caput Epigenetics</td>
<td>Ac. Year (September)</td>
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<td>Caput Molecular Biotechnology</td>
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<tr>
<td>Caput Protein Structure as Molecular Basis of Disease</td>
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<td>6.0</td>
<td>AM_470120</td>
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<tr>
<td>Caput Structural Biology</td>
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compulsory course

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choose at least 3 of these courses

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<tr>
<td>Developmental Biology</td>
<td>Period 2</td>
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<td>AM_470613</td>
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<td>Extreme Biology</td>
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Specialisation Ecology

The specialisation is focused on the functioning of and interactions among earth, plants, animals and micro-organisms and may approach these processes from divergent scales ranging for molecular genetic levels to regional scales. The aim of the programme is to provide the student with the knowledge, skills and insight required to operate as an independent professional within the field of Ecology and to be a suitable candidate for a career in research.

The specialisation Ecology is broader than the Masters Ecology and is intended for students who also want to specialise in other biological topics apart from Ecology. Students with a Bachelors degree oriented to Biology and Earth Sciences are invited to apply to this programme, which aims at approaching Ecology either from a molecular perspective or from a field scale approach and preferably both. The programme is taught in English. Those who want to focus upon ecology are encouraged to take part in the Masters Ecology of VU University Amsterdam.

The specialisation is open for all students in the MSc program Biology. Apart from this there are no specific entry requirements.

Three out of four specialised courses (18 credits) plus one internship or research project (30 credits) are obligatory plus an extra course, internship extension (6 credits) or literature study (together at least 54 credits). The rest of the programme can be filled in freely within the general requirements for a MSc Biology, including the general compulsory courses for the MSc Biology. In the research projects or internships students will focus on one or more of aspects of Ecology.

The specialised Ecology courses aim at providing the student with the different scales at which Ecology is active. The courses are strongly interactive, take place in small groups and are characterised by assignments, essays, case studies, lab practicals and/or fieldwork.

Programme components:

- optional modules
- compulsory course
choose at least 2 of these courses

optional modules

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<th>Periode</th>
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<td>AM_450137</td>
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<td>AM_470512</td>
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<td>Marine Biology and Oceanography</td>
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<td>Spatial Analysis for Ecologists</td>
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compulsory course

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choose at least 2 of these courses

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<td>Experimental Design and Analysis</td>
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<td>Soil-Plant Interactions</td>
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<td>Spatial Ecology and Global Change</td>
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Specialisation Integrative Plant Sciences

This specialisation provides a broad curriculum through the combined efforts of Plant Science groups from both the Swammerdam Institute for Life Sciences (SILS) of the University of Amsterdam (UVA) and the Institute of Molecular Cell Biology at VU University Amsterdam (VU). Training in theoretical and practical aspects of cell biology, genetics,
biochemistry and physiology is combined with ecology, systematics and population biology to give the student an integrative view of how plants function. Students should be able to understand biochemical processes as well as evolutionary and ecological questions and their interrelationship.

Compulsory master courses include plant breeding and biotechnology, biotic interactions, developmental biology, and abiotic stress. The aim of the curriculum is to provide the student with the knowledge, skills and insight required to operate as an independent professional within the field of integrative plant sciences, ready to take on an academic career or a job in industry or policy making.

The specialisation Integrative Plant Sciences offers the opportunity to follow an excellent program, including compulsory courses (24 credits, see below), an internal internship at one of the Plant Sciences groups at the UVA or VU University Amsterdam (40 credits), an external internship (30-40 credits) an internship extension (6 credits) and literature study (9 credits). Optional courses and Capita selecta can be chosen from within the Msc Biology program of both universities upon consultation with the co-ordinator.

Programme components:

- compulsory module
- choose at least 3 of these courses

verplicht vak

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<td>Developmental Biology</td>
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<td>Plant Breeding and Biotechnology</td>
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</tbody>
</table>

MSc Biology, compulsory courses

Opleidingsdelen:
Abiotic Stress

**Course objective**
Abiotic stresses represent the most limiting factor for agricultural productivity. This course aims to provide the student with general background knowledge and insight in recent progress on how plants sense abiotic stress and the mechanisms they have acquired to deal with it.

**Course content**
The course will start with lectures about the specific forms of abiotic stress that plants encounter. These include salinity, drought, flooding, temperature and heavy metal stress. Emphasis will be on how plants sense their environment and how perception of external signals is converted into a response at the molecular and physiological level. Also, potential applications for crop improvement will be discussed. Lecture material will be taken from book chapters of "Plant Physiology, Taiz and Zeiger, 4th edition" as well as from recent reviews on these topics. In the last 2 weeks, the students will write a project proposal on selected subjects. For this purpose, recent research articles will
be used. During the course there also will be demonstrations and short practicals.

**Form of tuition**
Lectures, (guest) seminars and literature study.

**Type of assessment**
Written exam (60%), literature Review/Project proposal (40%)

**Course reading**
Selected book chapters and review/research articles

**Entry requirements**
Bachelor Biology, Medical Biology, Biochemistry or equivalent.

**Remarks**
Please note: this course does not take place in 2010 - 2011; only offered every other year.

**Advanced Molecular Immunology and Cell Biology**

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<tr>
<th>Course code</th>
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<tbody>
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<td>Period</td>
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<td>Faculty</td>
<td>Fac. der Aard- en Levenswetenschappen</td>
</tr>
<tr>
<td>Coordinator</td>
<td>dr. M. van Egmond</td>
</tr>
<tr>
<td>Teaching staff</td>
<td>Dr. M. van Egmond</td>
</tr>
<tr>
<td>Teaching method(s)</td>
<td>Lecture, Study Group</td>
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</table>

**Course objective**
To understand cellular interactions within the immune system and how molecular diversity is generated to regulate immune responses
To acquire insight into the various strategies of host immune responses against pathogens, and how pathogens escape proper immune responses
To acquire insight into the various strategies of the host to positively or negatively affect immune responses during cancer
To understand the mechanism by which the immune system regulates either immune activation or tolerance induction
To acquire insight in the mechanism of cell migration within the immune system
To apply the acquired knowledge and interpret scientific literature and scientific hypotheses of each of the topics described above.

**Course content**
Immunology is a rapid growing field of research in medicine and attracts a lot of attention for its contribution in various diseases such as infection diseases, cancer and auto-immunity. The course will give the student the opportunity to enhance the knowledge on the scientific aspects within the field of immunology. Special focus lays on the immunological processes underlying homeostasis control i.e. tolerance induction, immunity, antigen presentation and processes that lead to the development of inflammatory diseases (infection diseases through pathogens), auto-immunity (neuro-immunology) and cancer.
(tumor-immunology). As this is an advanced course in the field of immunology, we will go into depth particular on molecular details. Students should be familiar with basic immunology preferably via a previous basic training course in immunology.

**Form of tuition**
The course covers immunological processes at the molecular level, and consists of lectures, self study and workshops. In the latter part students will read review articles as well as primary scientific articles on the subjects and discuss in groups opposing views on the molecular immunological processes that occur in the different stages of homeostasis and disease control. The large variety of modern immunological tools will be discussed which will facilitate the studied scientific articles. The first three weeks include lectures, self study and workshops, whereas the last week covers mainly self study and the exam. Workshops are indispensable.

**Type of assessment**
Both lectures and workshops are indispensable and form part of the material that covers the exam.  
Active participation in discussion is part of the appraisal. Written exam at the end of week 4 include 10 essay and 20 multiple choice questions.

**Course reading**
Parham - The immune system. 3rd Edition, ch. 1 to 10.  
Reader which covers recent reviews and scientific articles in the specialize fields as described above (ca. 10 euro).

**Entry requirements**
Bachelor’s course Immunology

**Target group**
This course is compulsory for the differentiation Immunology in the Master Biomedical Sciences FALW. Given the broad relevance of immunology in life sciences this course also provides excellent opportunities for other differentiations within this Master program. Msc students Biomedical Sciences with a keen interest to study immunological processes that form a basis for a variety of occurrence of diseases. In particular those that cover the interaction between host pathogen, host-tumor and homeostatic control.

**Remarks**
Maximum 70 participants.  
A solid base on knowledge on immunology is compulsory.  
In case of illness it is required to inform the coordinator prior to scheduled obligatory lectures, stating the reason of absence. When only one or two obligatory lectures are missed, it is possible to make a substitute assignment. This is not possible when more than two lectures are missed.

**Analysis of Governmental Policy**

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<th>Course code</th>
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<td>Language of tuition</td>
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</table>
Course objective
- To acquire critical knowledge regarding different policy models and theories
- To master the correct use of central concepts in political and policy discourses.
- To further deepen your analytic skills with respect to the critical assessment of a complex societal question or dilemma in the health and life science;
- To learn to integrate science-specific knowledge with the knowledge and skills of other disciplines of the social sciences
- To practice skills in data collection and analysis
- To learn to set up valid lines of argumentation;
- To learn to translate research findings into policy recommendations;
- To get experienced in writing a policy advisory report;
- To improve your communication skills;
- To improve your skills in working effectively in a project team, through team building, team analysis and feedback.

Course content
Governmental policy affects millions of people and is thus object of intensive debate and target of strong societal forces, like political parties, media and interest groups. Being an advisor or policy maker requires a thorough understanding of the dynamics of policy making, as well as from the psychological side as from the more social structures and their influence on a deliberative democracy.

The course contains several lectures on theoretical concepts and models concerning policy analysis. Furthermore you will be challenged, under supervision, to apply and practice these concepts and models in the project assignment. From the very first day, you will be part of a project team of about ten students. You are confronted with a real policy problem from an external commissioning institution (e.g. a non-governmental organization, a Ministry, an advisory council). Within those 4 weeks you will collect data by literature review and interviews and conduct an interdisciplinary analysis on the basis of which you provide an advice. Specific attention is paid to working in a project team and team building. At the end of the course, you prepare an advisory report. On the last day of the course you present the report to the representative of the external institution who commissioned the project. In that presentation your team will highlight the main results of your analysis and defend the recommendations you propose.

Form of tuition
Lectures, Training; Project assignment

Type of assessment
Written exam (25%) and individual evaluation based on personal performance in the project team (50%), and assessment of various group products (report and presentation (25%)). Exam has to be passed successfully.
Course reading
Buse, Mays and Walt: "Making Health Policy"

Target group
Compulsory course within the Masterprogramme Management, Policy Analysis and entrepreneurship for the health and life sciences (MPA) and the Societal differentiation of Health, Life and Natural Sciences Masters programmes.

Remarks
The case is policy analysis and advice, but the exercised methods and skills are equally applicable to strategic marketing advice or evaluation studies. The project integrates the learned lessons from the first two compulsory MPA courses: Qualitative & Quantitative Methods.

Aquatic Ecology

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<td>Faculty</td>
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<tr>
<td>Coordinator</td>
<td>prof. dr. J.E. Vermaat</td>
</tr>
<tr>
<td>Teaching staff</td>
<td>prof. dr. J.E. Vermaat</td>
</tr>
<tr>
<td>Teaching method(s)</td>
<td>Seminar, Practical</td>
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Course content
Commonalities versus specific features of aquatic ecosystems: lakes, rivers, estuaries, the sea. Interactions between water body and surrounding land (catchment). A systems perspective: important processes and the role of biota: marginal or crucial? Interactions among biota in the food-web (predation, competition) and otherwise (the role of engineers or keystone species, mutuality, mutualism). Aquatic biodiversity: what does it mean? Biota as indicators of water and sediment quality in rivers and lakes. Aquatic ecology for water quality and quantity management.

The course will be taught from Dobson & Frid (2009), with additional papers providing deepening for the chapters.

Form of tuition
Plenary lectures (5 x 4 = 20 hrs). Lecture format: Vermaat provides the general introduction, students have prepared and give a brief presentation of chapters 2+3, 4+5 and 6+7, respectively, of Dobson & Frid. Non-presenting students are expected to have prepared by reading these chapters and the two accompanying, deepening papers (see below) before the lecture. The lecture is concluded with 45 min debate on the two accompanying papers.

Comparative fieldwork in small groups of 2-4 students: spatial gradients among and within water bodies around Amsterdam (field 4 d, lab processing 4d), student seminars on fieldwork (4 hrs); student groups write a report on their fieldwork subject (length 5-10 pp, 11 pt Times New Roman, Introduction, Method, Results, Discussion, References containing ~ 10 papers from the primary literature)

literature study
Type of assessment
Written test (60%), fieldwork report (20%), oral presentations (both on book and lab work, content and quality, 10%), fieldwork performance (10%).
The written test is open book. It is composed of three questions on the book, two on the lecture notes, and one question on each of the three selected articles, in total therefore 8 questions. Answers can be written on the examination sheets. Each question has sufficient space to allow for your answer.

Course reading
(2) Lecture notes (Vermaat Aquatic Ecology), (3) selected articles (see below). (1)+(2)+(3) together for the written test.

For 2010 the following selected articles:

Rivers

Estuaries

Coastal Seas

Open Ocean

Target group
Elective for MSc Earth Sciences, Geo-environmental Sciences, various MSc programmes in Biology

Behavioral Genetics

<table>
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Course objective
To provide the Master of Neuroscience students with a solid basis in human behavior genetics and to provide an overview of empirical results.

Course content
Behavior genetics focuses on the inheritance of individual differences in complex traits. Such traits are most likely influenced by multiple genetic and environmental factors. The effects of genetic and environmental factors may be additive or interactive and lead to individual differences in complex traits and diseases that are quantitative rather than qualitative. In this course theory and principles from population genetics and biometrical genetics will be introduced, including genetic and cultural inheritance of complex phenotypes. Designs of family, adoption and twin studies and their applications to variation in cognitive abilities, personality and psychiatric disease will be discussed. The advances in molecular genetics have generated substantial progress in identifying the genetic basis of heritable traits using linkage and genome-wide association approaches. Both approaches will be reviewed and illustrated using recent studies aiming to identify genes genes underlying the vulnerability for psychiatric disorders, such as schizophrenia and mood disorders. Practical exercises will guide the student through some of the available online tools that facilitate the interpretation of gene-finding studies.

Form of tuition
Lectures, computer practicals

Type of assessment
Written examination; open-end questions (50%). Practical assignments and papers during the course (50%).

Course reading
To be announced via Blackboard

Entry requirements
BSc Biology, Biomedical Sciences, Psychology with profile Biological Psychology or Neuropsychology

Remarks
Attending the practicals is compulsory
Application: Course coordination (rsl.ligthart@psy.vu.nl)

Biotic Interactions

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Vrije Universiteit Amsterdam - Fac. der Aard- en Levenswetenschappen - M Biology - 2011-2012
6-3-2013 - Pagina 16 van 81
Course objective
This course provides knowledge on recent developments in research on plant-pathogen and plant-insect interactions. This will include the molecular targets and signal transduction pathways involved and the ecological aspects of biotic interactions in nature and in agriculture. With regard to defense against pathogens, the innate immune response and the gene for gene model will be discussed in detail. The role of jasmonate and salicylate in biotic interactions will be discussed. In addition indirect defense modes and the role of secondary metabolites will be illustrated by examples from ongoing research at the University of Amsterdam.

Course content
The following subjects will be dealt with:
Herbivore feeding styles
Pathogenicity modes, compatibility/ incompatibility
Induced defenses, Hypersensitive response and cell death
Plant viruses
Pathogenesis related-proteins
Innate Immunity
Elicitors and (a)virulence factors, Resistance-genes
Hormonal signaling Jasmonate and salicylic acid
Secondary metabolites in plant defense
Indirect defenses: plant volatiles
Tritrophic interactions
Engineered resistance

Form of tuition
Lectures, tutorials, practical/demonstration bioassays

Type of assessment
Written exam (70%) oral presentations (30%)

Course reading
Recent articles / reviews

Entry requirements
BSc Biology, Medical Biology, Biochemistry or equivalent

Remarks
Minimum 5, maximum 15 students (provisional).
Coordinator: dr. R.C. Schuurink (UvA)
Lecturers: dr. R. Schuurink, dr. M. Kant, dr. F. Takken, dr. M. Rep, prof. dr. B.J.C. Cornelissen (all UvA)

Business Management in Health and Life Sciences

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<tr>
<td>Faculty</td>
<td>Fac. der Aard- en Levenswetenschappen</td>
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Course objective
To acquire insight in different legal entities in which to organise a company or enterprise
To get acquainted with:
- financial and legal aspects
- patents and alternative valorization methods
- marketing and sales aspects of businesses
To acquire insight in Human Resource Management models
To get acquainted with different models of financing
To learn to think and act in line with economic and sustainability issues for the company

Course content
Increasingly, health students will be confronted with a corporate way of thinking in health organisations. To function in such an environment it is critical that students have basic knowledge of fiscal and legal entities and organisational forms of corporate structures (including start-ups). Furthermore, they have to understand what motivates decision makers and financial officers in different companies (also geographical differences). This course comprises a theoretical and a practical part. The theoretical part consists of interactive classes with various experts from the field. Topics that will be dealt with in detail include: intellectual property, portfolio management, finance, risk capital, grants and subsidies, team building and people management, different legal entities, fiscal and legal aspects when starting a new company, SWOT analysis in the life sciences and clinical trials. The practical part consists of bringing the knowledge acquired during the classes into practice in an assignment in which you develop a (personal career) businessplan.

Form of tuition
Lecturers, self study, assignment.

Type of assessment
Written exam and assessment of the (personal career) business plan. Both parts need to be passed.

Course reading
To be announced on Blackboard

Target group
Optional course for Master students Management, Policy Analysis and Entrepreneurship in Health and Life Sciences (MPA), Societal differentiation of the Health, Life & Natural Sciences.

Caput Cellular Protein Trafficking
Course objective
The aim of this theoretical course for master students is to study a number of recent, short and state-of-the-art review papers in the area of protein secretion and cellular protein trafficking. The students will get insight into the principles and mechanisms by which prokaryotic and eukaryotic cells target and insert proteins into membranes and target them subcellular organelles and the extracellular environment. The course will highlight the similarities between different organisms and the common mechanisms with respect to protein secretion and trafficking. Furthermore, the application of this knowledge and research in medical sciences and in biotechnology is addressed. The emphasis is on bacterial systems. End terms for the student:
- To know and understand the biochemical principles and molecular and cellular processes that play a role in protein targeting to biomembranes
- To know and understand the biochemical principles and the molecular and cellular processes that play a role in the insertion of membrane proteins into biomembranes
- To know and understand the biochemical principles and the molecular and cellular processes that play a role in the transport of proteins through biological membranes and into the extracellular environment.

Course content
Protein trafficking in E. coli:
Biogenesis of inner membrane proteins in E. coli.
Targeting and assembly of periplasmic and outer membrane proteins.
Protein translocation across membranes: secretion systems, their structure, biology, and function.
Protein trafficking in eukaryotes:
Biogenesis of membrane proteins, intracellular protein trafficking, vesicle transport.

Form of tuition
Personal contact with the tutor and introduction into the reading material, followed by self-study of the papers.
Possibly additional contact with the tutor.

Type of assessment
Written exam with essay questions

Course reading
A series of reviews

Target group
Students of all Master's programmes within Health and Life Sciences

Caput Community Genetics

<table>
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<th>Course code</th>
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<tr>
<td>Faculty</td>
<td>Fac. der Aard- en Levenswetenschappen</td>
</tr>
</tbody>
</table>
Course objective
Genetics and genomics may lead to a new understanding of genetic contributions to human disease and the development of rational strategies for minimizing or preventing disease phenotypes altogether. However, translation appears to lag behind: the new genetics will not revolutionize the way in which common diseases are identified or prevented.
This course aims to give an overview of current and future applications of medical genetics/genomics in health care. The student analyses current debates on pros and cons of these applications, as well as scientific developments in genetics/genomics and Technology Assessment related to these potential applications.

Course content
Existing genetic care in clinical genetic centres, genetic screening and prenatal diagnosis is studied. Future scenario's are debated, including the development of tailored prevention programs. From the British text book topics will be selected that are currently relevant for Dutch Health Care. Students analyse the state of affairs for these topics in the Netherlands, the stakeholders and parties involved in the debate, the positions taken by parties, to what extent an offer in health care exists or could be developed, what discussions are relevant, and report in a paper and oral presentations.

Form of tuition
Self study
Presentations on book chapters and journal articles followed by discussions in small working groups
Writing essay

Type of assessment
Paper (100 %); presence and participation in working groups

Course reading

Caput Epigenetics

<table>
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<th>Course code</th>
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<td>Faculty</td>
<td>Fac. der Aard- en Levenswetenschappen</td>
</tr>
<tr>
<td>Coordinator</td>
<td>dr. J.M. Kooter</td>
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</tbody>
</table>

Course objective
Acquiring knowledge and insight of
- Biochemistry and dynamics of DNA Modification and Chromatin Modification (DM&CM)
- Epigenetic mechanisms of gene control and genome maintenance
- Epigenetic inheritance of traits
Normal biological processes in human, animals, plants, fungi, and bacteria involving epigenetic mechanisms (depends on student’s MSc)
- Dynamic nature of epigenetic mechanisms and its causes
- The impact of epigenetics on human diseases

Course content
- Non-mendelian inheritance of traits
- Biochemistry of DNA methylation and de-methylation
- Biochemistry of histone modifications and chromatin structure
- Composition of chromatin and chromatin remodeling
- Somatic and gametic cell inheritance of epigenetic information
- Cellular memory by means of polycomb-group proteins
- Role of DM&CM in gene expression
- Role of epigenetics in cancer and other diseases
- Role of DM&CM in sex-chromosome inactivation and activation
- Role of DM&CM in gene-dosage compensation
- Role of DM&CM in genomic / parental imprinting
- Cloning of animals and epigenetics
- Impact of non-coding RNAs / RNA interference on DM&CM modifications
- DNA methylation as genomic defense mechanism
- Epigenomics: methylome
- Epigenetic effects of diet, nutrition, drugs and environmental factors
- Epigenetics and behaviour
- Genetically identical but epigenetically different individuals
- Transgenerational effects: inheritance of epigenetic-based traits
- Role of epigenetics in evolution
- Methods to analyze DM&CM

Form of tuition
- Self-study of research and review articles
- Group discussions in which we discuss the research and review articles
- Weblectures by experts

Type of assessment
Written exam

Course reading
From Blackboard site: Review and Research articles. It is advised to study the chapters on DM&CM and gene expression of the book, Molecular Biology of the Cell by Alberts et al., fifth edition

Entry requirements
Bachelor level Genetics and Molecular Biology

Target group
Master students: Biomolecular Sciences, Biology, Biomedical Sciences, Medical Natural Sciences, Pharmaceutical Sciences and Oncology

Caput Institutionalising Participatory Approaches in the South

<table>
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<td>Fac. der Aard- en Levenswetenschappen</td>
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<tr>
<td>Coordinator</td>
<td>dr. M.B.M. Zweekhorst</td>
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</tbody>
</table>
Course objective
- To develop a detailed understanding of the importance of participation strategies for sustainable development
- To understand the difficulties that have been identified for institutionalising interactive approaches within existing organisations
- To obtain insight into different strategies to institutionalize interactive approaches.
- To acquire knowledge on the learning organisation.

Course content
During the past three decades participation has become increasingly visible as an issue in development. It is recognized that participation is a key element in poverty eradication and sustainable development. Methodologies to enhance participation are now commonly used in development projects and 'participation' has become a development orthodoxy. However, it is one thing to acknowledge the effectiveness of participatory approaches, but another to apply these approaches consistently over longer periods of time. This requires institutionalisation of these approaches within the organisations concerned, so as to build the necessary capacity. Most organisations are not well adapted to the application of participatory approaches. Some organisational change is therefore likely to be necessary if participatory approaches are to be institutionalised successfully. In this theoretical course you study in depth scientific literature about various theoretical concepts and practical experiences of institutionalisation processes of interactive approaches that were undertaken by organisations in the South.

Form of tuition
This theoretical course comprises self study. After a short introduction you study various scientific articles that are then critically analyzed.

Type of assessment
Individual assessment though an assignment

Course reading
Selected scientific articles.

Target group
Optional course for Master students Management, Policy Analysis and Entrepreneurship in health and life sciences (MPA), Societal differentiation of the Health, Life & Natural Sciences.

Remarks
Self study. Basic knowledge on organisation and management is required.
For more information and application: anna.van.luijn@falw.vu.nl

Caput Molecular Biotechnology

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<tr>
<td>Faculty</td>
<td>Fac. der Aard- en Levenswetenschappen</td>
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</table>
Course objective
The aim of this theoretical course is to get insight in the principles, methods, and applications of recombinant DNA technology with respect to the broad field of medical and industrial biotechnology. To this end the students study a book. End terms:
To know and to understand the fundamental principles of modern molecular biotechnology as well as the most recent developments in that area of science
To know and to understand the newest molecular techniques and biotechnological applications of microbial and viral systems
To know and to understand the most recent developments, techniques and applications in eukaryotic systems including plants, animals and humans.

Course content
The development of molecular biotechnology; DNA, RNA, and protein synthesis; Recombinant DNA technology; Chemical synthesis, sequencing, and amplification of DNA; Bioinformatics, genomics and proteomics; Manipulation of gene expression in prokaryotes; Recombinant protein production in eukaryotic cells; Directed mutagenesis and protein engineering; Molecular diagnostics; Microbial production of therapeutic agents; Vaccines; Synthesis of commercial products by recombinant microorganisms; Bioremediation and biomass utilization; Plant-growth-promoting bacteria; Microbial insecticides; Large-scale production of proteins from recombinant microorganisms; Genetic engineering of plants: methodology; Genetic engineering of plants: applications; Transgenic animals; Regulating the use of biotechnology; Societal issues in biotechnology

Form of tuition
Initial contact with the docent, introduction into the book
self study
Possibly additional contact with the docent

Type of assessment
Written exam with essay questions.

Course reading

Target group
Students of all Master's programmes within Health and Life Sciences

Caput Protein Structure as Molecular Basis of Disease

<table>
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<th>Course code</th>
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<td>Fac. der Aard- en Levenswetenschappen</td>
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<tr>
<td>Coordinator</td>
<td>dr. D. Bald</td>
</tr>
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</table>
Course objective
Overview of recent advances in research of molecular disease based on protein structure;
Knowledge of the relation between protein structure/(mal-) function;
Knowledge of the relation protein (mal-) function/disease.
Screening/evaluation of scientific literature.

Course content
Suggested topics are:
• Antibiotic action
• Antibiotic Resistance
• Cancer/p53
• Anti-Influenza drugs
• Tuberculosis drug targets
• Anti-aids drugs
Feel free to suggest other topics related to protein structure/function, please ask the docent for more information.

Form of tuition
You receive several original publications on a recent topic in protein structure/disease (see above) from the docent. You study these papers and collect more information (data-base search etc.) about research in the field. Finally you can either write up your results in a review-style paper or give an oral presentation.

Type of assessment
Oral or written presentation (choice)

Course reading
Publications from the docent and database search/ literature survey

Target group
Masters students Biomolecular Sciences, Biomedical Sciences, Biology, Pharmaceutical Sciences, Medical Natural Sciences

Caput Structural Biology

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</tr>
<tr>
<td>Coordinator</td>
<td>dr. ir. Y.J.M. Bollen</td>
</tr>
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</table>

Course objective
To obtain knowledge about a topic in the field of protein structure and protein dynamics that currently attracts a lot of attention. To learn how to present and discuss scientific research.

Course content
One of the following topics:
- Adaptation of microorganisms to extreme environments
- Prion proteins
- Fluorescent proteins

Form of tuition
Self study, contact with lecturer is possible following an appointment

**Type of assessment**
Oral discussion with the lecturer

**Course reading**
A number of recent scientific papers will be provided

**Entry requirements**
See entry requirements for the specified MSc programs.

**Target group**
MSc students "Biology", "Biomolecular Sciences" and "Biomedical Sciences"

**Remarks**
The oral discussion with the lecturer can be done in English or in Dutch.

### Clinical development and clinical trials

<table>
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<th>Course code</th>
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<td><strong>Faculty</strong></td>
<td>Fac. der Aard- en Levenswetenschappen</td>
</tr>
<tr>
<td><strong>Coordinator</strong></td>
<td>prof. dr. H.J.H.M. Claassen</td>
</tr>
<tr>
<td><strong>Teaching staff</strong></td>
<td>prof. dr. H.J.H.M. Claassen</td>
</tr>
<tr>
<td><strong>Teaching method(s)</strong></td>
<td>Lecture, Computer lab, Study Group</td>
</tr>
</tbody>
</table>

**Course objective**
- To acquire knowledge and insight into the role and objectives of drug and clinical development process
- To acquire knowledge and insight into the clinical pharmacology in drug development, drug interactions, pharmacodynamic and metabolic interactions
- To acquire knowledge and insight into clinical study methodology
- To acquire knowledge and skills into the regulatory principles
- To acquire knowledge of ICH-GCP and quality
- To acquire knowledge and insight into clinical trial coordination
- To acquire knowledge and skills into the data management and statistics.
- To acquire insight into the ethical aspects
- To acquire insight into actual use of clinical trials in R&D strategies
- To learn to design a clinical study
- To acquire insight into the different epidemiologic study designs
- To acquire knowledge and skills into how exposure and disease in a population can be measured and how the relationships between them can be assessed (using SPSS)
- To acquire knowledge and skills into interpreting and presenting the results of an epidemiologic study

**Course content**
The need for rigorous evaluation of components of health care is increasingly recognised worldwide. An important type of evaluation is the clinical trial. The most commonly performed clinical trials evaluate new drugs, medical devices, biologics, or other interventions on patients in strictly scientifically controlled settings, and are required for regulatory authority approval of new therapies. This course aims to provide students with a theoretical and practical understanding of the issues involved in the design, conduct, analysis and interpretation of clinical trials of health interventions. Furthermore classes are provided on which the actual use of clinical trials in day to day R&D strategies within industry and universities is addressed in detail Classes include, "Strategies in High Throughput Screening (HTS)", "Use of Genomics in Drug Development and Diagnostics" and "Research for Functional Foods and Health Claims".

Together with other students, you will apply the theoretical knowledge by designing and presenting your own clinical study plan on the basis of a chosen/selected preclinical situation from real life daily practice.

The first part of the course closes with presentation of career implications in pharmaceutical industry and biotech companies.

An additional week of basic epidemiology will help you to complement the knowledge obtained so far in the course with an understanding of the principles of other types of study designs (cross-sectional, longitudinal, case-control). Issues concerning exposure and disease measurement and exposure-disease relationships will be discussed in detail, and examples will be provided.

Together with your colleagues, you will learn how to apply this knowledge first by hand (during the lectures), then to an epidemiologic database (during the afternoon computer-based sessions) and how to interpret the results critically.

The epidemiology week will close with presentations and discussions of the group work.

**Form of tuition**
Lectures, case study and self study (clinical trials weeks). Lectures (mornings), group work in computer-based sessions (afternoons) and self-study (epidemiology week)

**Type of assessment**
Individual assessment through a written exam

**Course reading**
To be announced on Blackboard

**Target group**
Optional course for Master students Management, Policy Analysis and Entrepreneurship in Health and Life Sciences (MPA), Societal differentiation of the Health, Life & Natural Sciences.

**Remarks**
For information and application: w.s.konijn@vu.nl

**Clinical Neuroscience**

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<th>Course code</th>
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Course objective
To provide the Master student, independently of his/her primary
training, with a solid basis in clinical neurological disease and
neuropathology. Tissue handling and interpretation of different aspects
of neurological disease (tissue, imaging, clinical history) will be
taught and overall disease insight will be improved.

Course content
We will focus on four commonly occurring neurological diseases;
dementias, multiple sclerosis, white matter diseases in children and
Parkinson's disease. The student will learn about general neurological
and epidemiological models (prevalence/incidence of different
conditions, diagnostic/prognostic process, treatment strategies, etc.).
Imaging characteristics of the four different neurological conditions
will be reviewed. Basic histochemistry techniques will be dealt with
and students will visit the neuropathology lab unit. Practical training
consists of brain cutting tutorials and tissue microscopy. During the
practical sessions, clinical information and knowledge from the
lectures will be implemented and tested interactively. In addition to
neuroimaging and neuropathology data, we will provide if
necessary/applicable electrophysiology data.
The aim is to familiarize the students with clinical neuroscience
literature. Common methods and statistics (effect size vs. statistical
significance, phase I/IV, false positive-negative results, etc.) will
be discussed.

Form of tuition
Lectures, practical sessions (microscopy), tutorials (brain cutting /
neuroanatomy), visits (MRI and histology lab), interactive training
(three days of workshops), case presentations

Type of assessment
Written examination (lectures and clinical line), presence and general
attitude (practical sessions and workshops)

Course reading
To be announced

Entry requirements
BSc Biology, Medical Biology, Biomedical Sciences, Medicine, Psychology
with profile Biological Psychology or Neuropsychology

Cognition and Attention
Course objective
To introduce students to the major research topics in the field of human attention and discuss experimental methods that can be used to investigate attentional performance

Course content
This course reviews current theories of attention. Topics covered are the relative influences of goal-driven and stimulus-driven control in attention, the relationship between attention and eye movements, dual-task performance, attention and memory, attention and inhibition, cross-modal attention, and the cognitive neuroscience and neuropsychology of attention. Emphasis will be placed on the different experimental designs that can be used to study attention.

Form of tuition
Lectures and class discussions. Students are expected to be prepared to discuss the literature assigned for each class.

Type of assessment
Written examination: open end questions

Course reading
To be announced on Blackboard

Communication, Organization and Management

<table>
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<th>Course code</th>
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<td>Faculty</td>
<td>Fac. der Aard- en Levenswetenschappen</td>
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<tr>
<td>Coordinator</td>
<td>dr. M.B.M. Zweekhorst</td>
</tr>
<tr>
<td>Teaching staff</td>
<td>dr. H. Wels, J. Maas MSc, prof. dr. F. Scheele, dr. M.B.M. Zweekhorst</td>
</tr>
<tr>
<td>Teaching method(s)</td>
<td>Lecture, Study Group</td>
</tr>
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</table>

Course objective
To get acquainted with theories on organisational behaviour
To obtain a deeper understanding of communication from the perspective of sharing and influencing results
To acquire knowledge on organisational structures and designs
To get acquainted with important theories on organisational transitions and change management
To acquire insight into different management practices in the health and life sciences sector
To gain insight in leadership and interpersonal behaviour
To obtain insight in methods for motivation and conflict management
To improve communication skills
To practise analytical and advisory skills

Course content
Organisations in the health and life science sector are changing fast, a phenomenon driven by newly emerging technologies and increasing societal complexity. A growing number of students with a beta degree will hold professional and managerial functions in these organisations. During
this course students will learn how to be effective performers within these environments, both individually and in teams. This requires an understanding of the macro aspects of organisational behaviour, including designing organisations, managerial skills and ways of strategic thinking. Several speakers conduct lecturers on aspects as motivation, managing interpersonal behaviour, leadership, communication and developing and changing organisations. The speakers explain theories from literature and relate them to their practical experiences. In addition, the students interview managers in health organisations and analyse these interviews using the newly acquired theoretical concepts. Also, practical cases of health care companies will be analysed and discussed, resulting in advisory reports for management. With the other students you discuss your experiences and a coach helps you relate the experiences to theory.

Form of tuition
Lectures, self study, training workshops project assignment

Type of assessment
Written exam (60%) and assessment of the interviews, case study analysis, and reports (40%). Grades of both parts must at least be 6 or higher.

Course reading
To be announced on Blackboard

Target group
Compulsory course within the Master programme Management, Policy Analysis and Entrepreneurship for the Health and Life Sciences (MPA) and the Societal differentiation of Health, Life and Natural Sciences Masters programmes

Remarks
Attendance to training, workshops, interviews and discussions is indispensable

Community Genetics

<table>
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<th>Course code</th>
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<tr>
<td>Coordinator</td>
<td>prof. dr. M.C. Cornel</td>
</tr>
<tr>
<td>Teaching staff</td>
<td>dr. C.G. van El</td>
</tr>
<tr>
<td>Teaching method(s)</td>
<td>Lecture, Study Group</td>
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</table>

Course objective
Genetics and genomics may lead to a new understanding of genetic contributions to human disease and the development of rational strategies for minimizing or preventing disease phenotypes altogether. However, translation appears to lag behind: the new genetics will not revolutionize the way in which common diseases are identified or prevented. This course aims to give an overview of current and future applications
of medical genetics/genomics in health care. The student analyses current debates on pros and cons of these applications, as well as scientific developments in genetics/genomics and Technology Assessment related to these potential applications.

**Course content**
Existing genetic care in clinical genetic centres, genetic screening and prenatal diagnosis is studied. Future scenarios are debated, including the development of tailored prevention programs. From the UK textbook topics will be selected that are currently relevant for Dutch health care. Students analyse the state of affairs for these topics in the Netherlands, the stakeholders and parties involved in the debate, the positions taken by parties, to what extent an offer in health care exists or could be developed, what discussions are relevant, and report in a paper and oral presentations.

**Form of tuition**
self study
Presentations on book chapters and journal articles followed by discussions in small workgroups
Writing essay
Lectures

**Type of assessment**
Paper (50%) and oral presentation (10%), exam with essay questions (40%)

**Course reading**
Other literature will be available at Blackboard.

**Entry requirements**
Volksgezondheid en Genetica (BSc, 470075) is highly recommended to know the basic principles of genetics at the start of the course. In case of uncertainty, please contact the lecturers.

**Remarks**
Taught in English unless no non-Dutch students are present. For further information please contact Martina Cornel (mc.cornel@vumc.nl)

**Developmental Biology**

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<td>Fac. der Aard- en Levenswetenschappen</td>
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<tr>
<td>Coordinator</td>
<td>prof. dr. R.E. Koes</td>
</tr>
<tr>
<td>Teaching staff</td>
<td>dr. ing. E.J. Souer, prof. dr. R.E. Koes</td>
</tr>
<tr>
<td>Teaching method(s)</td>
<td>Lecture</td>
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**Course objective**
The development of a single cell, the fertilized egg cell, into a complex organism with all its tissue and organs in the right place is
one of the most intriguing phenomena in biology. Whereas disciplines like molecular and cell biology aim to unravel the molecular mechanisms of a single cell, developmental biology aims to understand how such mechanisms make cells work together in a coherent way to form an entire organism.

The aim of this course is to provide insight into these molecular mechanisms, such as the regulation of the expression of master genes and cell-to-cell signaling pathways underlying plant and animal development.

Course content
The classroom format (the first two weeks) will be a mixture of seminars, lectures and self-tuition. During the first week emphasis will be on general principles in development, like early developmental patterns in vertebrate model systems such as mouse and zebra fish, invertebrates such as the fruitfly and development of plants and the role of key genes that control the fate of embryonic stem cells and the general body plan. In the second week there will be choice of two paths. Those following the master course on Developmental Neurobiology of the Vertebrate Brain will follow lectures on molecular mechanisms of general brain development. Those following the specialization Intergrated Plant Sciences within the Master Biology will have lectures focusing on molecular mechanisms of plant development. Other participants can freely choose one of these two paths. The theoretical aspects will be tested by a written exam.

In the third and the fourth week of this course specific aspects of development are highlighted by studying up to date research papers on selected "hot" subjects. The students will present a lecture (oral presentation) of their literature research at the end of the fourth week.

Form of tuition
Lectures and seminars

Type of assessment
Written exam (50%), Oral presentations (50%)

Course reading
Selected book chapters and (review) articles

Entry requirements
Bachelor Biology, Medical Biology, Biochemistry or equivalent.
Course Developmental Biology

Disability and Development

<table>
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<th>Course code</th>
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<td>Fac. der Aard- en Levenswetenschappen</td>
</tr>
<tr>
<td>Coordinator</td>
<td>dr. W.H. van Brakel MD</td>
</tr>
<tr>
<td>Teaching method(s)</td>
<td>Lecture, Study Group</td>
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Course objective
To develop an understanding of disability and the issues faced by people with disabilities.
To develop knowledge and skills for disability research, policy development and management related to disability, rehabilitation and development

To acquire insight into the epidemiology of disability, with separate attention for important determinants like gender, poverty and HIV/AIDS

To learn how to use relevant models of disability and the conceptual framework of the International Classification of Functioning, Disability and Health (ICF)

To understand the importance of human rights in relation to disability and to learn to use the UN Convention for the Rights of Persons with Disabilities for advocacy and other rights-based interventions

To acquire skills and knowledge in measurement and research methods relevant to disability

To understand the importance of inter-sectoral collaboration

To gain insight in participatory approaches

**Course content**

The Disability and Development (D&D) course focuses on a broad range of issues related to disability and rehabilitation in the context of development. This means that the focus is on people with disabilities in low and middle-income countries. Disability affects an estimated 600 million people worldwide, the majority of whom live in low and middle-income countries. The large majority are poor and have no access to rehabilitation services; neither are facilities in place to allow them to be included in the mainstream of society. To date, very few services and programmes are available to address these needs. The realisation that the Millennium Development Goals cannot be met without addressing the needs of people with disability has brought a new impetus to the field concerned with these issues, disability and development. Another major recent development was the adoption of the UN Convention on the Rights of Persons with Disabilities in December 2006. It is expected that there will be a substantial increase in demand for training of a large variety of professionals (e.g. researchers, managers, architects, lawyers, health professionals) with formal training and qualifications in the field of disability and development. This rapidly increasing interest in disability as a development and human rights issue means that this emerging field of study will rapidly gain in importance and should become part of any serious higher education in social and development studies and in international public health. The course will cover essential knowledge and skills in this subject. During this 4-week course the following subjects will be discussed:

- Disability models and stereotypes, culture and disability, ICF conceptual framework, experience of having a disability, frequencies and distribution of disability, determinants of disability, including stigma and discrimination, poverty, gender and HIV/AIDS, rights of persons with disabilities, the UN Convention on the Rights of Persons with Disabilities, measurement of disability, disability-relevant research methods, survey methods, examples of disability research and an introduction to community-based rehabilitation.

**Form of tuition**

Lectures with practical exercises, tutorial groups based on problem-based learning, self study, experiential learning and group assignments

**Type of assessment**

Assessment is based on individual assignments and tutorial group work (40%) and an individual written examination (60%). Grades of both parts
must at least be 6 or higher.

**Course reading**
An online reader will be available on Blackboard

**Target group**
Optional course for Master students Management, Policy Analysis and Entrepreneurship in Health and Life Sciences (MPA), specialisation International Public Health within the Master Health Science and specialisation International Public Health within the Master Biomedical Sciences. External students from low and middle-income countries are also encouraged to apply.

**Remarks**
Because of the highly interactive teaching methods used, the maximum number of students is 40.
More information: a.van.luijn@vu.nl.

**Ecotoxicology and Environmental Quality**

<table>
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<tr>
<th>Course code</th>
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<tr>
<td>Faculty</td>
<td>Fac. der Aard- en Levenswetenschappen</td>
</tr>
<tr>
<td>Coordinator</td>
<td>prof. dr. ir. J. Legler</td>
</tr>
<tr>
<td>Teaching staff</td>
<td>dr. ir. C.A.M. van Gestel, prof. dr. ir. J. Legler, dr. ir. T.H.M. Hamers</td>
</tr>
<tr>
<td>Teaching method(s)</td>
<td>Lecture, Practical</td>
</tr>
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**Course objective**
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

**Course content**
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

Type of assessment
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.

Course reading
Syllabus containing scientific literature

Entry requirements
BSc in Biology, Ecology, Biomedical Sciences, Health Sciences, Earth Sciences or Chemistry

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

Emotional and Cognitive Neuroscience

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<th>Course code</th>
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<td>Fac. der Aard- en Levenswetenschappen</td>
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Course objective
Knowledge of the most important psychiatric disorders and basic aspects of underlying emotional and cognitive dysfunctions.

Course content
After a general introduction, there will be a special session on how to perform a psychiatric investigation and how to obtain a biography. The focus of the course will be on depression and anxiety disorders, addiction, bipolar disorder, schizophrenia, PTSD, delirium, and neuroimaging of psychiatric disorders. In these sessions, we will discuss both clinical aspects, using video demonstrations, and basic aspects, using the corresponding chapters from Principles of Neural Science (see below; ch. 47-51 en ch. 60-61)

Form of tuition
During the sessions we will judge on active participations by the individual students. During the final session there will be an
examination on paper.

**Type of assessment**
Written examination

**Course reading**

**Entry requirements**
Behavior and Cognition (470709)

**Remarks**
Attendance of at least 80% of the time of the course is obligatory. Maximum 15 attendants. Registration via tisvu.vu.nl, as well as sending an e-mail to the course coordinator: s.vanrossum@ggzingeest.nl.

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### Entrepreneurship in Health and Life Sciences

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<tr>
<td>Coordinator</td>
<td>prof. dr. E. Masurel</td>
</tr>
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<td>Teaching staff</td>
<td>prof. dr. E. Masurel</td>
</tr>
<tr>
<td>Teaching method(s)</td>
<td>Lecture, Study Group</td>
</tr>
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**Course objective**
Students obtain knowledge about and insight in the relevance of entrepreneurship and innovation for their own discipline. Students learn about the processes which are involved in the recognition and exploitation of opportunities, about creating economic and social value and about the nature and role of networks. In addition students gain knowledge of different entrepreneurial processes and the importance of valorisation of (bio)medical findings and business ideas for a knowledge-based economy.

**Course content**
This course consists of two tracks: a theoretical track and a practical track. These two tracks run simultaneously.
In the first track you learn about entrepreneurship. Answers are found on questions such as: What is entrepreneurship? What defines an entrepreneur? What are entrepreneurial opportunities? What is the role of innovation in entrepreneurship? What is corporate social responsibility (CSR)? How can we judge the feasibility of entrepreneurial ambitions?
Simultaneously you work on an assignment (second track). In the first week of this course you search for an innovation in your own discipline (product, service, process etc). Your choice must be approved by the lecturers. The first part of the assignment consists of a description of the innovation which you have chosen. Subsequently, you make a SWOT-analysis and a network analysis of the innovation. Also a paragraph on CSR aspect should be added. The final part of the assignment is your own feasibility study: how would you valorize the
innovation to the market?

Form of tuition
Lectures, personal meetings. Each week scientific lectures are given (on entrepreneurship, SWOT-analysis, innovation, CSR etc). These lectures are both the basis for the exam and for the assignment. Each week the student has a short meeting with his/her supervisor, in order to discuss the progress of his/her assignment.

Type of assessment
You conduct a written exam and an assignment. Both the exam and the assignment determine 50% of the grade. The exam and the assignment must be of sufficient quality.

Course reading
To be announced on Blackboard

Target group
Optional course for Master students Management, Policy Analysis and Entrepreneurship in Health and Life sciences (MPA), M-differentiation of the Health, Life & Natural Sciences, Biology, Biomedical Sciences.

Remarks
Attendance is compulsory. Prior knowledge: Business Management in Health and Life sciences. For information and application: anna.van.luijn@falw.vu.nl

Environmental Genomics and Adaptation

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<tr>
<td>Coordinator</td>
<td>dr. ir. T.F.M. Roelofs</td>
</tr>
<tr>
<td>Teaching staff</td>
<td>dr. H. Schat, dr. ir. T.F.M. Roelofs</td>
</tr>
<tr>
<td>Teaching method(s)</td>
<td>Lecture, Computer lab, Practical</td>
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</table>

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

Course content
Researchers in ecology and physiology are making extensive use of molecular techniques. Environmental genomics can be used to advance our understanding of how organisms make functional responses to changes within their local environment and its consequences for species.
abundance, community diversity, and the evolution of speciation. In this course we will focus on:
  Regulated gene expression. Which genes are turned on in response to environmental change, 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?
  Evolutionary consequences of genomic variation. What are the ecosystem-, community-, and population-level consequences of the molecular transformations performed by these genes?
Reference will be 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.

Form of tuition
Lectures, a seminar discussing recent literature, practical training and self study.

Type of assessment
Report and oral presentation of a research paper (30% of final grade).
Results of assignments (required online submission). Written exam (70% of final grade).

Course reading

Entry requirements
Evolutionary Genetics (AB_470053) or Molecular Developmental Biology (AB_470038)

Target group
This course is open to all students following the program of MSc Ecology and to students with a Bachelors degree in studies related to Oceanography. The capacity is limited to 21 external students and entries by students in their first or second Master study year will be given priority. Acceptance of participation will be decided no later than 1 March 2012. The course is free but the fee for lodging and meals amounts to approximately 250 euro. Application must be made via the website www. fokuz. nl Coordinators at NIOZ are Prof. Dr. Herman Ridderinkhof, Dr. Henko de Stigter (Henko.de.Stigter@nioz. nl; T 0222- 369401) en Magda Bergman (Magda. Bergman@nioz.nl; T 0222 369474). The FOKUZ Marine Master Course is part of a cooperation with Utrecht University, University of Groningen, University of Amsterdam and Vrije Universiteit Amsterdam. Students from other (Dutch) universities are also welcome to apply.

Ethics in Life Sciences

<table>
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<td>Faculty</td>
<td>Fac. der Aard- en Levenswetenschappen</td>
</tr>
<tr>
<td>Coordinator</td>
<td>prof. dr. J.T. de Cock Buning</td>
</tr>
</tbody>
</table>
Course objective
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's own life science specialization and to open it for an impartial and constructive discussion
To exercise a team-based project to assess the moral dilemmas and implicit/explicit moral rules of a specific life science discipline
To acquire the necessary skills to handle ethical issues in an accountable manner, as a professional academic beyond one's own inclinations and prejudgments.

Course content
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 and invited lectures by experts from the fields of genetic counselling, medical ethics and business 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 audit is done upon one of the VU life science departments.

Form of tuition
Lectures, workgroups, group assignment with presentation

Type of assessment
Degree of intellectual participation in the workgroups (25%)
exam (50%)
written and verbal presentation of the group assignment (25%)

Course reading
Available on Blackboard

Entry requirements
Bsc Biology, Biomedical Sciences, Psychology with profile Biological Psychology or Neuropsychology

Target group
Compulsory course in all FALW Master programmes, except Health Sciences

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

Experimental Design and Analysis

<table>
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<th>Course code</th>
<th>AM 470505 ()</th>
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<tr>
<td>Period</td>
<td>Period 2</td>
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</table>
Course objective
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

Course content
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.

Form of tuition
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.

Type of assessment
Assignments and report on the final case study

Course reading
Experimental design and data analysis for biologists by G.P. Quinn and
M.J. Keough, Cambridge University Press
Entry requirements
Methodology and statistics 1 and 2 or equivalent statistics courses
(contact lecturer in the latter case)

Target group
Master students in Biology, Ecology or Earth Sciences and PhD students
with a deficiency in experimental design and statistics. The course is
obligatory for students in the MSc Ecology.

Experimental neurophysiology

<table>
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<tr>
<td>Faculty</td>
<td>Fac. der Aard- en Levenswetenschappen</td>
</tr>
<tr>
<td>Coordinator</td>
<td>L.N. Cornelisse BSc</td>
</tr>
<tr>
<td>Teaching staff</td>
<td>dr. R.M. Meredith, dr. C.P.J. de Kock, L.N. Cornelisse BSc</td>
</tr>
<tr>
<td>Teaching method(s)</td>
<td>Lecture, Computer lab</td>
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Course objective
To provide expert training in electrophysiology based on two pillars:
- presenting a theoretical basis for understanding and measuring
electrical activity and neuronal communication in the brain
- teaching how to perform electrophysiological experiments (miniproject)

Course content
The core of this course will be your miniproject (2 weeks). During this
project, you will learn to perform electrophysiological experiments
under the supervision of an experienced tutor. The miniprojects will be
preceded by the necessary theoretical background to understand the
fundamental principles of communication in the brain (+ exam, 1.5
week). At the end of the course, you will learn how to analyze and
present your data (+ presentation, 0.5 week).

Form of tuition
Miniproject, interactive seminar classes, journal clubs

Type of assessment
Written exam (35%), journal club discussion/participation (25%),
Practical work (20%), final data presentation (20%)

Course reading
Reader on Blackboard, research papers to be handed out at the start of
the course.

Entry requirements
Principles of Neurosciences (470701)

Extreme Biology

<table>
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<tr>
<th>Course code</th>
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<tr>
<td>Period</td>
<td>Period 2</td>
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</table>
Course objective
At the end of this course, the student will be able to describe and explain various aspects of adaptation to extreme environments:
• how cellular structures (e.g. membranes) and individual molecules (proteins/DNA) are affected by physical parameters like temperature, pH, salt, pressure and radiation
• how nature has solved these problems: what are the general and condition-specific adaptations to extreme conditions,
• what are the limits for life, and its relevance to the development of life on Earth and other planets,
• how can we exploit natures extreme adaptations?
• how to write a research proposal on an extremophile topic of choice

Course content
Biology of extreme life forms, or living under extreme environmental conditions, (in short extreme biology) has attracted more and more attention in recent years. Reasons for this increased interest are diverse: scientific curiosity (what solutions has nature come up with), understanding evolution of life on earth, and the potential for life on other planets, medical interest (cryobiology, sensor technology, enzyme technology), societal commitment (pollution, climate change) and industrial applications (novel enzymes with new applications). The key question is how extremophiles have adapted their enzymes/membranes/DNA structures etc. that serve the same function, but operate under very different physical constraints. The course will focus on life forms (mainly microorganisms and plants and some examples from animal life) that have developed in environments that we do not experience as ‘normal’. ‘Normal’ relates to environmental factors like temperature, water, oxygen, pressure, radiation, pH, salinity etc. Environments that are extreme with respect to these factors are e.g. hot springs, ice, deep sea, deserts, acidic/alkaline or saline waters or sites polluted by industry. At the end of the course the students must be able to:
• Identify and describe extreme environments.
• Describe the most important physical parameters that form a limitation for biological processes.
• Understand why and how physical parameters affect specific biological processes.
• Describe strategies developed by extremophiles to protect membranes, protein structures and DNA.
• Give examples of possible applications of extreme biology in science, industry, medicine, agriculture etc.
• Use the knowledge to write a research proposal on a subject of choice.

Form of tuition
The course consists of lectures, workshops and presentations. Selected chapters of one book will be used. In addition, lecturers will discuss
recent reviews and research papers with the students. Learning how to write your own research proposal will be an important part of the course. Each student will choose an extremophile topic of his/her choice and submit/defend a research proposal at the end of the course.

**Type of assessment**
Written exam with essay questions (50%), Journal Club presentations and Research Proposal (50%).

**Course reading**
Selected review and research articles.

**Entry requirements**
Bsc Biology, Biomedical Sciences

**Target group**
Master students Biomolecular Science, Biology, Ecology and Biomedical Sciences with an interest in the extra-ordinary forms of life.

**Genomes and Gene Expression**

<table>
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<tr>
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<td>dr. J.M. Kooter</td>
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<tr>
<td>Teaching staff</td>
<td>dr. J.M. Kooter</td>
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<tr>
<td>Teaching method(s)</td>
<td>Lecture, Study Group</td>
</tr>
</tbody>
</table>

**Course objective**
To provide students with the latest insights and concepts of the various ways gene expression in eukaryotes is regulated.

**Course content**
The following topics will be covered:
Transcriptional regulation:
- Genome organization: coding versus non-coding sequences
- Composition and biochemistry of basic transcription machinery
- Transcription initiation, elongation and termination
- Regulatory sequences: promoters, enhancers, suppressors, boundaries
- Application of comparative genomics to identify cis-acting elements
- Epigenetics: Chromatin structure and histone modifications
- Epigenetics: DNA methylation
- Monoallelic gene expression
- Nuclear structure and long range DNA interactions
- Transcription regulation throughout the cell cycle
- Transcription regulation and development
- Regulatory networks: the regulation of regulators
- Cellular memory: establishing and maintaining differentiation status
- Gene expression control in stem cells and differentiation
- Non-coding RNAs and control of gene expression
Intergenic and antisense transcription
Techniques and applications
Post-transcriptional regulation
RNA processing, including alternative splicing and its regulation
Nucleo-cytoplasmic RNA transport
RNA stability and degradation pathways
RNA interference (siRNAs)
RNA regulation (microRNAs)
RNA-editing
Riboswitches
Techniques and applications
Analysis of gene expression
Human transcriptome
Single-gene analyses and techniques
Deep sequencing and micro-arrays

Form of tuition
- This advanced Master course consists of lectures, including lectures by guest speakers, and literature discussions. We aim for a highly interactive meetings.
- Weblectures by experts

Type of assessment
Open and closed questions (multiple choice)

Course reading
- Basics and introduction from Chapters on gene expression regulation from Molecular Biology of the Cell by Alberts et al., fifth edition
- Advanced subjects from Research and Review articles (downloadable from Blackboard)
- PPT-notes from lectures

Target group
Master students: Biomolecular Sciences, Biology, Biomedical Sciences, Pharmaceutical Sciences and Medical Natural Sciences

Remarks
Compulsory portal course for MSc students Biomolecular Sciences, all differentiations

Gezondheidsjournalistiek (Health journalism)

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<td>Fac. der Aard- en Levenswetenschappen</td>
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<tr>
<td>Coördinator</td>
<td>prof. dr. F.J. Meijman</td>
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<td>Docent(en)</td>
<td>Prof. Dr. F.J. Meijman</td>
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<tr>
<td>Lesmethode(n)</td>
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Doel vak
Kennis vergaren over en oefening van vaardigheden op praktische deelterreinen van de publiekscommunicatie van gezondheid, ziekte en
zorg. Gezondheidsvoorlichting in de zin van gedragsbeïnvloeding is niet de invalshoek, wel de vaardigheden als journalist of tekstschrijver.

**Inhoud vak**

**Uitwerking**
Via schrijf- en studieopdrachten, (werk)colleges en literatuurstudie komen aan de orde:
- journalistieke genres als nieuwsbericht en achtergrondartikel;
- persbericht en andere contacten met de media (publiciteitscirkel);
- informatiebronnen voor publieksinformatie;
- populariseren en jargon;
- medisch journalistieke missers;
- richtlijnen en codes voor de (gezondheids)journalistiek.

Studenten werken aan opdrachten of presentaties en schrijven beargumenteerde beoordelingen (recensies) van de werkstukken van andere studenten. Werkstukken worden voor zover mogelijk individueel of groepsgewijs met (praktijk)docenten besproken.

**Onderwijsvorm**
Drie of vier van de vijf werkdagen zijn er gezamenlijke bijeenkomsten die starten met een (werk)college of presentaties. Een belangrijk deel van de tijd is gereserveerd voor het uitvoeren en bespreken van de opdrachten en het raadplegen van de docenten. Een schriftelijke toets met open vragen en een praktische opdracht vormt de afsluiting.

**Toetsvorm**
Het eindcijfer wordt als volgt samengesteld: toets 40 %, achtergrondartikel 40%, presentaties of vervangende opdracht 20 %. Minpunten voor ontbrekend commentaar op het werk van andere studenten.

**Literatuur**
Teksten en overzichten op Blackboard; dictaten van (werk)colleges (leerstof toets)

**Doelgroep**
Keuze cursus voor studenten binnen de masteropleiding Health Sciences

**Overige informatie**

**Health, Globalisation and Human Rights**
Course objective
To acquire knowledge and understanding of the relationship between global public health issues and the global protection of human rights
To analyse how violations of human rights affect health and well-being
To learn methods of human rights assessment in relation to innovations in health technology
To acquire insights into the cultural dimensions of human rights values in relation to public health

Course content
This course focuses on the human rights issues that are raised around the globe in connection with public health concerns. The course introduces the students to the effects of globalization on health issues, to the relevant UN human rights instruments on health and to the mechanisms to promote and protect these rights. Attention is given to a wide range of human rights topics in which health and well being play a crucial role. Examples are situations of armed conflict, reproductive rights, migration and refugee issues and childrens rights. Within the context of current globalisation processes the importance of local cultural insights into the human rights & public health interaction will be discussed. During the course students will prepare and participate in a simulation on a human rights assessment of innovations in health technology and discuss relevant scientific literature in study groups. In the exam students will show their creative problem-solving skills applying them to human rights dilemmas in public health.

Form of tuition
Lectures, workgroups, group project, self study

Type of assessment
Group project, simulation, exam. All parts need to be passed (6.0)

Course reading
Reader to be announced on Blackboard

Target group
Optional course for students in all differentiations of the Masters Health Sciences, Biomedical Sciences and Management, Policy Analysis and Entrepreneurship in Health and Life Sciences.

Remarks
For more information: c.dedding@vu.nl

History of Life Sciences
Course objective
-Gaining an insight into the historical roots of recent practices and theories in the life sciences.
-Awareness of the role of social factors in the development of the life sciences
-Learning to deal with historical questions and literature

Course content
We will address several of the more conspicuous changes in the life sciences during the last two centuries, such as the emergence of modern genetics, the social basis of Darwin's theory of evolution, the 'molecularization' of the life sciences, the rise and fall of the eugenic movement and the complex relationship between ecology and environmentalism. Three additional themes running through the course are the nature of scientific discovery, the disciplinary organization of science and the interaction between science and society.

Form of tuition
Plenary lectures. Group assignments involving presentations. Course information, course lectures and readings, assignments and instructions will be posted on Blackboard.

Type of assessment
The final grade is the weighted average of the grades of the group presentation and the individual written exam.
Group assignment: 40 %, written exam 60 %.

Course reading
Articles

Remarks
N.B. 2012 - 2013 is the last possibility to follow History of Life Sciences.

Individual work master FALW

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Course objective
To acquire insight into the need for different ways of (professional) communication
To understand the dilemmas and constraints, which have been identified for interactive communication
To establish and put into practice a framework for analyzing interactive communication
To practice skills in interactive communication

Course content
Changes in society have resulted in a growing need for (more) interactive communication. Within this course we analyze the change from Public Relations as a one way stream (such as Postbus 51 commercials) to interactive communication (such as debates, conversations) at three levels. First of all, we assess the changes which have occurred within the societal context which reduced the success of the one-way stream. What does the transformation of the industrial society towards the network society mean for communication strategies? And, what limitations are faced by interactive communication at the macro-level (such as lock-in, resilience, institutional tradition). Secondly, what does this mean for communication instruments? For example, what is the difference between one-way and two-way communication? How do you recognize the difference between a genuine open dialogue and a debate between different points of view? Thirdly, what are the constraints of interactive communication at the individual level? How can you recognize these within conversations and debates? Assessment of the
relations and connections between the different levels forms an essential part of the course. Students will gain insight into the relevant theoretical concepts underlying the need for interactive communication.

**Form of tuition**
Lecturers, self study, workshops, training workshops and individual assignments.

**Type of assessment**
Assessment is based on individual assignments, a group assignment and active participation. All assignments need to be passed.

**Course reading**
Reader

**Target group**
Optional course for Master students Management, Policy Analysis and Entrepreneurship in health and life sciences (MPA), Science communication and Societal differentiation of the Health, Life & Natural Sciences.

**Remarks**
Attendance of workshops and training workshops is compulsory.
For information: frank. kupper@falw.vu.nl

**Internship Brain and Behaviour**

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**Internship Cell Biology**

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**Internship Communication Specialisation**

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Internship Communication Specialisation

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Internship Ecology

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Course objective
Both the minor (30 EC) and major (36 EC) 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 as well as an oral presentation given.

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 drinking-water producing companies. 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 accepted.

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 at the FALW programme secretariat.

**Internship Education Specialisation**

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**Internship Integrative Plant Sciences**

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Internship Societal Specialisation

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Interpersonal Communication

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Course objective
After this course a student can:
- analyse interaction patterns and communication processes in groups;
- reflect on his/her own patterns in communication and their influence on communication processes;
- formulate effective development aims to improve his/her personal communication skills, especially in leadership roles.

Course content
This course is concerned with gaining insight in interaction patterns that take place in a group. Central focus:
- your own contribution to the communication, as a member of a group;
- your possibilities to fulfill a professional 'leader's role' when necessary.

We work with the Interpersonal Teacher's Behaviour Model, which is used in the secondary teacher training program. This model is applicable in many other professional communication situations. Effects of the 'leader's behaviour' on that of group members are analyzed. Also, 'effective' behaviour will be trained.

Form of tuition
Seminars and workshops during which theory will be analysed with the help of video images and practice through active training; identifying interaction patterns; training/rehearsing of communication skills.
Type of assessment
On the basis of an assignment (e. g. via a video fragment), of which the results will be displayed in the portfolio.

Course reading
Reader

Target group
Optional course in the C- differentiations (Science Communication) of most of the twoyear Master programs of FALW and FEW

Remarks
Course is taught in Dutch. Maximum participants: 20

Literature Thesis Biology (Research)

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Marine Biology and Oceanography

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<td>prof. dr. J. van der Meer</td>
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Course objective
The main aim of the course is to introduce the student to the field of marine biology and oceanography. How does the Sea work? This course for MSc students is organized by FOKUZ (Fundamenteel Onderzoek Kust en Zee), a joint research programme of the NIOZ Royal Netherlands Institute for Sea Research (Texel) and the NIOO- Centre of Estuarine and Marine Ecology (Yerseke). The course will have a comprehensive programme covering all main disciplines of Oceanography: Physics, Chemistry, Biology, Geology.

Course content
Most days of the course will comprise lectures in the morning, followed by field work in the afternoon during which students will do measurements with supervision by oceanographers from NIOZ and NIOO-CEME.
Multidisciplinary programmes will be done in the western Wadden Sea on the research vessels Navicula and Stern. The course will be concluded by one day for data analysis and a full final day of oral presentations. The lecture program comprises 24 presentations in four disciplines, dealing with the following topics:
2. Physical Oceanography: Introduction, Tidal generation and propagation, Temperature and salinity in the world ocean, Waves, Estuarine salinity variations, Climate change in the Wadden Sea, Observations in Oceanography, Data management, data sources
3. Chemical Oceanography: Introduction, Isotope chemistry, The carbonate system and ocean acidification, Organic contaminants, C, N, P and Si cycling, including diagenesis
4. Biological Oceanography: Introduction, Origin of life (evolution and diversity), Primary production (incl nutrients and light), Microbial foodweb (trophic levels, recycling), Secondary production (mesozooplankton etc), Fisheries research

Form of tuition
Apart from following the lecture program and participating in various excursions/cruises, students are actively involved in small field studies. Students work in groups of 3 persons. Each group has to give a final presentation. Potential subjects for the field studies are (1) First acquaintance with Marsdiep and Mokbaai, (2) Tidal cycles anchor station Marsdiep, (3) Core sampling Texelstroom and Mokbaai, (4) Multibeam Texelstroom (Navicula), and (5) Horizontal surveys hydrography and plankton.

Type of assessment
Judgement and examination will be based on the field study (66.7%), and the oral presentation (33.3%).

Course reading
No specific literature.

Target group
This course is open to all students following the program of MSc Ecology and to students with a Bachelors degree in studies related to Oceanography. The capacity is limited to 21 external students and entries by students in their first or second Master study year will be given priority. Acceptance of participation will be decided no later than 1 May 2010. The course is free but the fee for lodging and meals amounts to 250 euro. Application can be made via the website www.fokuz.nl

Coordinators at NIOZ are Prof. Dr. Herman Ridderinkhof and Dr. Martien Baars (baars@nioz.nl; T 0222-369511). The FOKUZ Marine Master Course is part of a cooperation with Utrecht University, University of Groningen, University of Amsterdam and Vrije Universiteit Amsterdam. Students from other (Dutch) universities are also welcome to apply.

Methods in Behavioral Neurosciences

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Course objective
The course will give an overview of methods used in behavioral neuroscience.

Course content
In behavioral neuroscience we study how different brain areas are involved in the control and execution of behavior. First and foremost, the methods used have to capture important aspects of the normal behavior of the animal. Also, in order to obtain results that are both reproducible and reliable it is important that the methods used are standardized. Questions that we will address are: i) how can we record animal behavior in a reproducible fashion? ii) which behavioral parameters are important? iii) how do we analyze the data that we have obtained?

Examples of subjects that will be studied:
- Behavioral domains
- Standardization of behavior tests
- Recording and analysis of electrical activity in behaving animals
- Recording and analysis of animal vocalization
- Tests and measures of emotionality: from anxiety to fear
- The use of telemetry (wireless recording) in behavior research
- Spatial learning tests in rodents

Form of tuition
Lectures/Demonstrations

Type of assessment
Student presentation (15%) and written examination with open end questions (85%)

Course reading
To be handed out

Entry requirements
Neurobiology of Animal Behavior

Microbial Ecology

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Course objective
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

Course content
The vast majority of life on this planet is microbial. Microbial organisms are huge in their numbers, biomass and diversity, and Earth’s
evolution is tightly linked to microbial evolution and activities. We are also becoming increasingly aware of the importance of microbial ecology in the practical issues of society and the environment; from agriculture and human health and nutrition, to understanding and predicting climate change.

However, our knowledge of microbial diversity and activities in the environment is rather limited, mostly due to the difficulties associated with studying microbes (they are difficult to see, and often impossible to culture). Fortunately, recent breakthroughs in the application of molecular biological and genomics methods are beginning to provide the means to study the diversity and activities of microbes in the environment.

This course will first provide a brief history of the field of microbial ecology, and an outline of the general characteristics of microbes and microbial communities. It will then proceed highlight the most important methodological advances that have been essential to recent advances in microbial ecology. Subsequently, several important examples will be presented regarding the role of microbial ecology in key environmental issues, including effects of global climate change, pollution and other anthropogenic pressures on Earth’s ecosystems.

The course will consist of both instructional lectures (in English), as well as practical laboratory instruction. Lectures will consist of a series of general lectures on the principles of microbial ecology, given by the two course organizers, as well as several lectures provided by guest speakers with particular areas of relevant expertise. For the practical elements, students will carry out mini-projects in small research teams, and each student will be required to give a short presentation of research findings for the class. Students will also be evaluated via a written examination at the end of the 4-week course.

**Form of tuition**
Lectures, practicals and short research projects

**Type of assessment**
Students will be graded based upon a written examination at the end of the course, as well as a presentation based upon their practical work carried out in the laboratory. Student performance during laboratory practical work will also be assessed. These evaluations will be weighted as follows: 40% written exam, 30% lab presentation, 30% practical proficiency in the laboratory.

**Course reading**
A packet of literature and references will be provided to all participants prior to the start of the course

**Molecular Infection Biology**

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Course objective
To understand how the interaction of a pathogen with its host is studied (in vitro studies, use of alternative in vivo models, different approaches of mutant screening).
To understand the variation within microbial pathogens and the effect this variation has on host adaptation.
To understand what virulence factors are and how they are regulated by the pathogen.
To apply the acquired knowledge to interpret scientific literature and scientific hypotheses regarding pathogen-host interactions.

Course content
The recent explosion in genomic data of both microbes and eukaryotic hosts and the continuous progress in molecular biology allows a detailed analysis of the molecular interactions between a pathogen and its host. This knowledge is necessary because we are continuously exposed to new emerging pathogens and the resurgence of old plagues and need new vaccines and anti-microbial compounds. However, which technique should and could be used for a specific problem and how to interpret conflicting outcomes using different experimental strategies? This course aims to provide a thorough understanding and practical experience of molecular biology as it applies to infectious agents. The course covers the application of molecular biology to studying the basic biology of pathogenic bacteria and viruses (their virulence factors, taxonomy and genetic typing) and the genetic susceptibility of the host to infection. It aims to equip students with the specialised knowledge and skills necessary to assess primary literature on medical microbiology.

Form of tuition
The course has three different parts: lectures, practicum and workshop. In the latter part students will discuss with each other opposing views on controversial topics in medical microbiology that recently appeared in the literature.

Type of assessment
written exam (50% of final mark and should be minimally 5,5)
literature discussion (workshop, 30% of final mark)
practicum (20% of final mark)

Course reading
Reader and primary literature

Entry requirements
Bachelor’s course 'Infectieziekten' and 'Immunologie' or an equivalent course in Microbiology and Molecular Biology with practical skills of handling microorganisms safely

Target group
Students with a keen interest to study the interaction between a pathogen and its host, from a practical as well as a theoretical point of view

Remarks
Students in the MSc programme specialisations Infectious Diseases and Immunology have priority
Nature of Life Meetings

<table>
<thead>
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<th>Course code</th>
<th>AM_470510 ()</th>
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<tr>
<td>Period</td>
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<tr>
<td>Faculty</td>
<td>Fac. der Aard- en Levenswetenschappen</td>
</tr>
<tr>
<td>Coordinator</td>
<td>prof. dr. J. Ellers</td>
</tr>
<tr>
<td>Teaching staff</td>
<td>prof. dr. J. Ellers</td>
</tr>
<tr>
<td>Teaching method(s)</td>
<td>Lecture, Study Group</td>
</tr>
</tbody>
</table>

Course objective
To obtain a broad overview of the latest research in ecology and associated fields of research
To learn to critically evaluate scientific research articles
To practice skills of scientific argumentation and discussion

Course content
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, but many courses leave little room for such interaction.

In this course students will attend the Nature of Life seminar series organized by the Institute of Ecological Sciences with exciting invited international or national speakers. The topics for the seminars cover the whole spectrum of ecology and associated fields of research, such as geology, molecular biology, evolutionary biology. An overview of upcoming and previous seminars can be found at www.falw.vu.nl/iew/natureoflife.

Form of tuition
In preparation for these seminars, several recent papers by the guest speaker will be studied and extensively discussed during tutorial meetings with staff members of the Institute of Ecological Sciences. Students are required to participate actively in the discussion during the tutorials and at the seminar itself.

Type of assessment
Assessment at each tutorial for active participation, theoretical insight, and argumentation of the students at the tutorials and seminars.

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

Target group
Master students in Biology, Ecology or Earth Sciences. This course is also open to PhD students from the SENSE research school.

Remarks
Neurobiology of Animal Behaviour

Course code
AM 471018 ()

Period
Period 1

Credits
6.0

Language of tuition
English

Faculty
Fac. der Aard- en Levenswetenschappen

Coordinator
dr. R.F. Jansen

Course objective
The course will give an overview of (current) research of the neural basis of animal behavior. The course is designed for students who already have a basic knowledge of neurobiology and behavior. In this course we will study of a number of model systems. We will do this by critically reviewing both recent literature and a number of classical papers.

Course content
When we study the neural basis of behavior we investigate how, in a biological setting, nervous systems generate behavior. This is done by combining evolutionary and comparative approaches to the study of nervous systems. Questions that we will address are: i) how do neural circuits cause the different species- specific behaviors?; ii) how can we compare the nervous systems of different animals in this respect? iii) what exactly are the sensory worlds of the different animals and how do environmental factors contribute to the different behaviors?

Examples of subjects that will be studied:
- How do we measure behavior?
- Spatial orientation in the bee and the desert ant;
- The auditory world of the bat and the owl;
- Escape behavior in the cockroach and the crayfish;
- The tactile world of the star- nosed mole;
- Olfactory systems and social behavior;
- Emotional learning and anxiety.

Form of tuition
Lectures

Type of assessment
Student presentation (15%) and written examination with open end questions (85%)

Course reading
To be handed out

Entry requirements
Basic knowledge at the level of e.g. Alcock: Animal Behavior.

Neurogenomics

Course code
AM 470706 (450003)

Credits
5.0

Language of tuition
English
Course objective
To provide the Master of Neuroscience students with a solid basis in understanding the working and function of genes and genome in relation to the development and functioning of the nervous system.

Course content
The course will address the various aspects of functional analysis of the genome. The course will address the following topics:
- The search for genes and gene variants, which are underlying neuronal physiology and pathology, including forward genetics and gene-hunting strategies.
- Functional assignment of genes through reverse genetics
- Gene expression analysis of neuronal cells and brain areas (gene expression profiling)
- The analysis of proteins (proteomics) and complexes thereof
- Simulation of genetic networks
- The introduction of various model organisms relevant for neurogenomics research, such as, man, mouse, Drosophila, C. elegans, and zebrafish.

Form of tuition
Lectures, experiments, computer practicals

Type of assessment
Practical task, written examination with open end questions. Mutual weight announced at the start of the course.

Course reading
To be announced

Entry requirements
Bachelor Biology, Biomedical Sciences, Psychology with profile
Biological Psychology or Neuropsychology

Remarks
Taught in English. For those lacking a biology background studying Essential Cell Biology (Alberts 2nd, 3rd ed, chapters 4, 7 and 8) is highly recommended. For further information and application, please contact Guus Smit (guus.smit@falw.vu.nl)
Course objective
To provide the master students with the essentials of modeling neurons and neuronal networks and of analyzing spatiotemporal patterns of neuronal activity.

Course content
The new interdisciplinary field of neuroinformatics combines neuroscience with disciplines such as computer science, mathematics, physics and computational biology to advance and deepen our understanding of the nervous system. In particular, neuroinformatics is concerned with (i) computational and mathematical modeling of neural systems at all levels of biological organization, from synapse up to cognition; (ii) computational and statistical analysis of complex experimental data; and (iii) developing and applying data bases and data-mining tools.

During this course, we will address the following topics: (1) Modeling of single neurons and ion channels (single- and multiple-compartment models), synapses and synaptic plasticity (developmental plasticity and network formation, long- and short-term synaptic plasticity), neuronal networks (microcircuits, large-scale neuronal networks, associative memory, oscillations and synchrony), and learning and cognition (unsupervised, supervised, and reinforcement learning). (2) Approaches for analyzing spatial and temporal patterns of neuronal activity (EEG measurements, multi-electrode recordings, voltage-sensitive dye activity). (3) Use of simulation packages Matlab and NEURON. (4) Introduction to numerical methods for solving differential equations, and phase-plane and bifurcation analysis of differential equations.

Form of tuition
Lectures, demonstrations, practical assignments. An important part of the course will consist of computer experiments with respect to modeling and data analysis.

Type of assessment
Written examinations; open-end questions. Practical assignments and papers during the course.

Course reading

Research and review papers will be handed out during the course.

Entry requirements
Participants of the Master of Neurosciences at the VUA have priority. In addition, when capacity allows, we will accommodate students from other master programmes who have at least a bachelor’s degree in Biology, Biomedical Sciences, Psychology with profile Biological Psychology or Neuropsychology, with an affinity for mathematics and computer programming. Also students with a bachelor’s degree in Physics, Mathematics and alike, with an interest in neurobiology, can enter this course.
Remarks
For further information and application please contact Arjen van Ooyen (arjen.van.ooyen@falw.vu.nl). The course can be followed in parallel with training stages, including a training stage in Neuroinformatics.

Neuronal Networks in Vivo

Course objective
The aim is to provide insight into the most intricate neuronal network of the brain – the cortical micro-circuit. You will learn the basic floor plan of the cortex and find out the function of different layers and multiple cell types. As the course title suggests, all topics will be addressed from the in vivo perspective which aims to combine cortical function with animal behaviour. You will get hands-on experience in in vivo experiments, data analysis and how to identify different types of cortical neurons.

Course content
The course starts with plenary lectures on cortical circuitry and on recent advances to study the properties of cortical networks. These advances involve in vivo imaging and electrophysiological techniques that are applied in anaesthetized and awake animals. The lectures will gradually merge into a master class setting where you will work on a mini-thesis. In the mini-thesis you will review two experimental papers (from a pre-selected set) and write a research proposal involving in vivo experiments. In addition, the course will feature demonstrations of in vivo experiments, practical (histological) work and will be concluded with a workshop where you learn how to discriminate and recognize different cortical cell types using real rat brain slices. At the end of the course, you will present your mini-thesis to your peer students.

Form of tuition
Plenary lectures, literature discussions, demonstrations and workshops.

Type of assessment
Exam (40%), participation in discussions and workshops (20%), presentation (40%).

Course reading
Reader (freely available through Blackboard), research papers to be handed out at the start of the course.

Entry requirements
To be announced

Target group
Master of Neuroscience students of VU University Amsterdam or other universities. The course is optional for all Master of Neuroscience tracks.
Plant Breeding and Biotechnology

### Course objective
This course provides knowledge on recent developments in plant breeding and future prospects in plant biotechnology. A thorough understanding of plant breeding and genetic modification is linked to applications in various fields (crop improvement, functional food, medicines, soil remediation and biofuel production). After a general introduction into a field, recent papers covering new developments in biotechnology will be discussed by/with the participants. Students should get acquainted with technological challenges and possibilities of Plant Biotechnology. Through case studies, societal aspects of the application of current GM-crops will be discussed.

### Course content
The following subjects will be dealt with:
- Modern plant breeding (DNA markers)
- Plant transformation, T-DNA integration and expression
- RNAi methodology and application
- GM-Crops worldwide (including societal aspects)
- Plants as sources for food supplements and nutrients
- Production of pharmaceutical proteins and chemicals
- Biofuel production
- Phytoremediation

### Form of tuition
Lectures, paper discussion, practical/demonstration of technologies.

### Type of assessment
Written exam (70%), oral presentations (30%)

### Course reading
Selected book chapters, recent articles and reviews

### Entry requirements
Bachelor Biology, Medical Biology, Biochemistry or equivalent

### Remarks
Coordinator: prof. dr. M.A. Haring (UvA)
Course objective
To further deepen your analytic skills with respect to the assessment of a specific societal problem;
To acquire further insight into the practice of interactive research;
To acquire further insights into specific methods and techniques of interactive research;
To strengthen the skills to design an interactive research project
To practice skills in data collection and analysis;
To learn to set up valid lines of argumentation;
To improve your communication skills;
To improve your skills in working effectively in a project team, through team building, team analysis and feedback.

Course content
In this course you get the chance to gain experience in the practical implementation of methodologies for interactive research. In a four week policy project you will both improve your focus group research skills and deepen your understanding of the relevant theoretical concepts in the areas of policy studies, science and technology studies and democracy theory. In a group of about ten students you will participate in a real interactive research project which is executed at the Athena institute. In this project you will trained in and practice with various skills for data collection (such as focus group discussions and Socratic dialogue) and data analysis (such as qualitative content analysis). Specific attention is paid to your personal interactive research skills: how to facilitate group discussions. At the end of the course, you prepare a policy report to present your findings. In a powerpoint presentation your team will highlight the main results of your analysis and defend the recommendations you propose.

Form of tuition
Lectures, training workshops, project assignment

Type of assessment
Individual evaluation based on personal performance in the project group and assessment of various group products (report and presentation). All six parts need to be passed.

Course reading
To be announced on Blackboard

Target group
Optional course for Master students Management, Policy Analysis and Entrepreneurship in Health and Life sciences (MPA), Societal differentiation of the Health, Life & Natural Sciences.

Remarks
Basic knowledge of (interactive) policy processes, policy analysis and relevant research skills are required. Attendance is compulsory.
Principles of Neuroscience

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<td>Faculty</td>
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</tr>
<tr>
<td>Coordinator</td>
<td>dr. W.J.A.J. Smeets</td>
</tr>
<tr>
<td>Teaching staff</td>
<td>prof. dr. H.D. Mansvelder, dr. W.J.A.J. Smeets</td>
</tr>
<tr>
<td>Teaching method(s)</td>
<td>Lecture</td>
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</table>

**Course objective**
Providing the master student, independently of her/his primary training, with a solid basis in cell biology, neurophysiology and functional neuroanatomy.

**Course content**
The following chapters of Principles of Neural Science (Kandel et al., 2000; McGraw Hill) will be dealt with: Cell and Molecular Biology of the Neuron: Ion channels; Membrane potential; Local signalling: passive electrical properties of the neuron; Propagated signalling: the action potential. Synaptic Transmission: Overview of synaptic transmission; Signalling at the nerve- muscle synapse; Transmitter release. The Neuroanatomy of the Brain: The anatomical organization of the central nervous system; The functional organization of perception and movement. Perception: The Bodily Senses; Touch; The perception of pain; Central visual pathways. Movement: The organization of movement; Voluntary movement; The cerebellum; The basal ganglia.

**Form of tuition**
Research lectures, practicals, demonstrations

**Type of assessment**
Written examination; open end questions

**Course reading**
Recent research papers will be handed out during lectures.

**Entry requirements**
Bachelor Biology, Biomedical Sciences, Psychology with profile Biological Psychology or Neuropsychology

**Remarks**
Taught in English. Practicals and demonstrations are compulsory. For further information and application, please contact dr. WJAJ Smeets; (wjaj.smeets@vumc.nl)

Qualitative and Quantitative Research Methods
Course objective
Understanding the differences between beta- and gamma research
To acquire insight and understanding of a transdisciplinary research process. This includes knowledge of the character of and need for transdisciplinary approaches, and their advantages and disadvantages
To acquire insight into various quantitative and qualitative research methods and their underlying theoretical concepts
To understand the relative strengths and weaknesses of the various research methods
To know how to interpret quantitative and qualitative findings
To acquire insight and understanding of the possibilities to integrate quantitative and qualitative research information
To be able to make an adequate transdisciplinary research design for the investigation of a specific problem.

Course content
Contemporary societies increasingly face complex social problems, like climate change, HIV/AIDS or ethnic and religious diversity. These complex problems involve a variety of social actors: policy-makers, professionals, NGOs, industry, science and of course the public at large. Addressing such complex issues demands a transdisciplinary approach that investigates, analyzes and integrates the positions and knowledge of different actors. This course offers an (advanced) introduction to various research methods used in transdisciplinary research: questionnaires, systematic observations using all the senses, surveys and statistics, semi-structured in-depth interviews, as well as several interactive and participatory methods. These methods are commonly used in transdisciplinary research into complex problem contexts, communication, and opportunities for intervention. Strengths and weaknesses of each research method and technique will be discussed, as well as its possibility to be applied in different societal contexts.
Throughout the course, you will apply theoretical knowledge about the various research methodologies in the training of different qualitative and quantitative methods, and in making a research design. In small groups, students are trained in: (1) qualitative research methods such as semi structured interviews and observation techniques, (2) quantitative research methods such as questionnaires, (3) analysis of the data, and (4) writing a transdisciplinary research design.

Form of tuition
Lectures, training workshops, self study

Type of assessment
Group assignment (50%) and exam (50%). Both parts need to be passed (6).

Course reading
Reader or book (details will be announced on Blackboard)
Quantitative Methods in Neuroscience and Genetics

**Course objective**
To provide the Master of Neuroscience students with a solid understanding of the core methodological and statistical concepts relevant in the life and social sciences.

**Course content**
A number of plenary lectures will introduce key methodological and statistical concepts as they are used in ongoing psychological and neurophysiological research on behavior, genetics, and psychopathology. Students will be shown that solid experimental methodology and appropriate statistical analyses can support theoretical scientific inquiry. Computer practicals will be used to train the students in organizing and analyzing (large) datasets using SPSS and signal processing tools. Students will be taught to apply highly popular statistical techniques (t-tests, analysis of variance, principal components analysis) and to judge what technique is appropriate for the different research questions. Lectures on the quantitative methods will be interspersed with practicals on the same topics so as to allow the students to apply their newly gained knowledge immediately to real data.

**Form of tuition**
Lectures, computer practicals

**Type of assessment**
Written examination (with open end questions, 60%) and assignments (40%)

**Course reading**

**Entry requirements**
BSc Biology, Biomedical Sciences, Psychology with profile Biological Psychology or Neuropsychology.
Remarks
Language: tuition in English
SPSS exercises based on the analyses performed during the practicals.
Attending the lectures and practicals is obligatory
Application: Course co-ordination (dja.smit@psy.vu.nl)

Regional Hydrogeology and Groundwater Management

<table>
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<tr>
<td>Coordinator</td>
<td>prof. dr. P.J. Stuijfzand</td>
</tr>
<tr>
<td>Teaching staff</td>
<td>prof. dr. P.J. Stuijfzand</td>
</tr>
<tr>
<td>Teaching method(s)</td>
<td>Seminar, Computer lab</td>
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</tbody>
</table>

Course objective
Providing insight into groundwater occurrences on earth, actual and ancient recharge and discharge, water balances, hydrological and hydrochemical systems analysis, groundwater monitoring and tracing, fresh/salt relationships and groundwater management with emphasis on artificial recharge and river bank filtration systems.

Course content
After introducing the concepts of porosity and permeability the hydrogeological characteristics of various regions in the world are explored, in connection with their geomorphology, lithology / sedimentology and structural geology. In addition to this global view, case studies are presented from the Netherlands (humid; deltaic environment), Portugal (Mediterranean; karstic aquifers), Botswana (arid; igneous/metamorphic rocks and sediments) and Surinam (tropics; sedimentary coastal plain).

Groundwater mapping techniques based on both a hydrological and hydrochemical systems analysis are elucidated. The computer code HyCA (HydroChemical Analysis), for managing water quality data, is demonstrated and applied in practical excersises. The dynamics in flow and chemistry of groundwater are explained in terms of natural and man-made variations in groundwater recharge and discharge, fresh and salt water intrusion / inundation, pollution and leaching of aquifers, and climate change.

Methods are demonstrated to (a) determine the water balance and groundwater recharge, (b) monitor groundwater pressure and quality, (c) determine the origin and age of groundwater, and (d) image groundwater flow using physical, chemical and isotope tracers. Various techniques are presented to manage groundwater in stressed environments. The focus is here on artificial recharge and river bank filtration, with special attention to define suitable hydro(geo)logical settings and to optimize water quality improvements during aquifer passage.

Form of tuition
Lectures, practical exercises, literature study.

Type of assessment
Written exam (100%).
Course reading
Physical and Chemical Hydrogeology, by Domenico & Schwartz, last edition (1998 or later), syllabi and handouts.

Entry requirements
Advice regarding previous courses taken: 450024: Inleiding Hydrologie.

Science and Communication

<table>
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<td>Faculty</td>
<td>Fac. der Aard- en Levenswetenschappen</td>
</tr>
<tr>
<td>Coordinator</td>
<td>prof. dr. J.E.W. Broerse</td>
</tr>
<tr>
<td>Teaching staff</td>
<td>prof. dr. J.E.W. Broerse, Prof. Dr. C.J. Hamelink, R.C. van Koten MSc</td>
</tr>
<tr>
<td>Teaching method(s)</td>
<td>Lecture, Study Group</td>
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</table>

Course objective
To learn about the most recent developments in science communication and in communication sciences in general;
To deepen knowledge of different models for science communication;
To gain theoretical insight in the dynamic relationship between science and society;
To acquire knowledge on the interaction between science and policy;
To apply theoretical knowledge in describing current issues in Science Communication;
To acquire skills in essay-writing;
To provide a sound theoretical basis for Science Communication in practise

Course content
In the context of the changing dynamics within and between science and society, it becomes increasingly important to understand the types of communication processes at the core of several interfaces; communication between scientists from different disciplines, between different sciences and their stakeholders, and between science and the public. This module starts with a reflection on science and knowledge from different perspectives: Questions that will be addressed include: What is science? What does it mean to develop scientific knowledge? and How does the development of that knowledge relate to other social and cultural processes? With this reflection in mind, the course will cover the current state-of-the-art in science communication research (e.g. models of science communication) and in communication science in general, which will be applied to real-life examples from science journalism, new media and museum exhibitions. In addition, top scientists from different scientific disciplines will give lectures about their views on and experiences with science communication.

Form of tuition
Lectures and seminars on theory and practice of science communication.
Type of assessment
Assessment based on an individual essay (30%), group assignment (10%) and written examination (60%). For all parts of the assessment a pass-grade needs to be obtained.

Course reading
To be announced

Target group
Compulsory course for Master students in the C-specialisation (Science Communication) of the Masters Biomedical Sciences, Biology and any of the natural sciences.
Optional course for Master students Management, Policy Analysis and Entrepreneurship in Health and Life Sciences (MPA), M-specialisation of the Masters Biomedical Sciences, Biology, and any of the natural sciences.

Remarks
Students in Health, Life and Natural sciences who are interested in other master courses in Science Communication are strongly advised to enrol for this course. For information and application: c.a.c.m.pittens@vu.nl.

Science Communication through Museums

<table>
<thead>
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<th>Course code</th>
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<tr>
<td>Coordinator</td>
<td>dr. J.F.H. Kupper</td>
</tr>
<tr>
<td>Teaching staff</td>
<td>dr. J.F.H. Kupper</td>
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<tr>
<td>Teaching method(s)</td>
<td>Lecture, Study Group</td>
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</table>

Course objective
Gain insight in the role of museum exhibits in the field of science communication
Apply theoretical notions of science communication, science education and exhibit design to advise on adjustments and/or development of exhibitions
Apply theoretical notions of science communication and science education to perform science communication research in museum settings
Apply qualitative and quantitative research methods to design/perform/report on research project in museum settings

Course content
This course consists of lectures on the role of science museums/centers, zoos and natural history museums in science communication. You will get familiar with theories of science communication and informal science education in museum setting, introducing different educational methods as well as styles of communication, different approaches to exhibit design and development and different methods of research and evaluation of exhibitions. Guest speakers give insight into their profession as science communicators in museums and science centers, as researchers in the
field of museology and as professionals in developing informal science learning programs. Through several assignments you are encouraged to combine theory and practice. The assignments are developed in collaboration with museums and science centers, such as NEMO, Naturalis and Artis.

**Form of tuition**
Lectures, workgroups, assignments and home-study

**Type of assessment**
Assignments (40%), presentations (10%), written exam (50%)  
For all assignments, presentations and exam a pass-grade must be obtained.

**Course reading**
Reader, provided at start of course

**Entry requirements**
Bachelor in any of the Beta Sciences

**Target group**
Optional course in the C-differentiations (Science Communication) of most of the two year master programs of the FALW and FEW faculties

**Remarks**
Course is taught in Dutch (with the possible exception of foreign guest speakers).  
For information: reinout.van.koten@falw.vu.nl

### Science in Dialogue

<table>
<thead>
<tr>
<th>Course code</th>
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<tr>
<td>Coordinator</td>
<td>dr. J.F.H. Kupper</td>
</tr>
<tr>
<td>Teaching staff</td>
<td>dr. J.F.H. Kupper</td>
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<tr>
<td>Teaching method(s)</td>
<td>Study Group, Lecture</td>
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**Course objective**
To gain knowledge and insight into:
- the basic concepts and issues in the understanding of science-society interactions, both from a philosophical and communication science perspective
- the nature and course of interpersonal and group communication processes relevant to the formal and informal dialogue between science and society
- the nature and form of dialogical science communication, aimed at mutual understanding and learning

To acquire or improve:
- the individual student's skills for effective interpersonal communication
- the individual student's skills for the design and facilitation of the science-society dialogue
Course content
This course examines the public character of scientific controversy and focuses on the communicative aspects of a fruitful science-society dialogue. At the dawn of the 21st century, science, and particularly fields that combine science and engineering such as nanotechnology and synthetic biology, holds a great promise for the progress of our societies. At the same time, these developments are controversial. They lead to a variety of concerns related to risks, benefits and wider moral issues. Nanotechnology creates materials with novel characteristics that help us, but may also contain risks for health and environment. Synthetic biology develops new biological systems that may be very useful, but radically change the nature and meaning of life. Clearly, advances in science do not always match the needs, desires and expectations of society. On the other hand, parts of society might not always appreciate the nature and scope of scientific findings. For a fruitful relationship between science and society, a constructive science-society dialogue is necessary.

This course offers advanced lectures on the basic concepts and issues of dialogical science communication: communication, learning, dialogue, understanding, controversy, democracy. A series of workshops and small group assignments presents communicative tools and spaces such as discussion games, science theatre and multimedia platforms that can be used to design and facilitate science-society interactions. Training workshops will focus on improving the students’ individual communication and facilitation skills. The students’ individual learning curve as a science communicator and facilitator is monitored by means of a personal development plan. The course is completed with an individual essay assignment about the sense and nonsense of the science-society dialogue.

Form of tuition
Guest lectures, Interactive lectures, Training workshops, Individual and Group Assignments, Personal Development Plan

Type of assessment
Essay assignment, Small Group Assignments, Personal Reflection Log

Course reading
Articles and chapters are made available on Blackboard

Target group
Optional course in the MSc specialization Science Communication

Remarks
Independence and a cooperative attitude is expected. Attendance to training workshops is indispensable.

Science Journalism

<table>
<thead>
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<th>Course code</th>
<th>AM 471014 ()</th>
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<td>Coordinator</td>
<td>dr. J.F.H. Kupper</td>
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<tr>
<td>Teaching staff</td>
<td>dr. M.J.W. Bos</td>
</tr>
</tbody>
</table>
Course objective
Gaining insight in popularization of the beta sciences in various media;
Learning how to write popular science articles;
Learning how to write specific genres like news, interviews, and background articles.

Course content
This course consists of lectures about practical and theoretical aspects of science journalism. Topics are the role of science journalism in constructing relations between science and society, images of science in the press, ethical aspects of science journalism and communication barriers between scientists and journalists. Guest speakers give insight into their profession as science journalists (freelancers and editorial staff), working for newspapers (NRC), magazines (NWT), internet (Noorderlicht) or broadcasting (Hoe?Zo! Radio) media. Moreover, you receive training in all aspects of writing popular science articles, such as data collection (interviewing), writing techniques and targeting publics.

Form of tuition
Lectures and seminars on theory and practice of science journalism and writing skill training. Considerable time is set aside for writing popular science articles. The assignments are assessed by lecturers and fellow students (peer-review process).

Type of assessment
Assessment is based on weekly assignments and a final assignment. The final assignment needs to passed. Three out of four weekly assignments need to be passed.

Course reading
Articles and book chapters distributed via Blackboard.

Target group
All Master students with a Beta-Bachelor degree. Students taking this course as part of their C-differentiation within FALW or FEW will have precedence over other students. Students from other faculties and or universities need to get formal consent from the course co-ordinator (Frank Kupper) before enrolment.

Remarks
Course is taught in Dutch. More information: frank.kupper@falw.vu.nl.

Scientific Writing in English

<table>
<thead>
<tr>
<th>Teaching method(s)</th>
<th>Lecture, Study Group, Computer lab</th>
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<tbody>
<tr>
<td>Course code</td>
<td>AM_471023 ()</td>
</tr>
<tr>
<td>Period</td>
<td>Ac. Year (September), Period 2</td>
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<tr>
<td>Credits</td>
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<td>Language of tuition</td>
<td>English</td>
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<tr>
<td>Faculty</td>
<td>Fac. der Aard- en Levenswetenschappen</td>
</tr>
<tr>
<td>Coordinator</td>
<td>dr. J.H. Meijer</td>
</tr>
</tbody>
</table>
Course objective
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.

Course content
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.

Form of tuition
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.

Type of assessment
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.

Course reading
The reader 'Writing a Scientific Article' can be obtained at the VU Bookshop (25 euro)

Target group
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).

Remarks
- Taught in English
- Registration for this course automatically gives access to the corresponding Blackboard site. In Blackboard the students enroll for one of the groups. This will be possible as from August 18th, 2012. Two groups will only be accessible for MSc students Neurosciences; all other groups are open for any FALW student.
- Unfortunately, course overlap is well possible; you'll have to try, possibly with fellow students, to arrange a little schedule bending with either course co-ordinator. No guarantees though.

Soil Vegetation Atmosphere Exchange

<table>
<thead>
<tr>
<th>Course code</th>
<th>AM_450060 ()</th>
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<tr>
<td>Period</td>
<td>Ac. Year (September), Period 4</td>
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<tr>
<td>Coordinator</td>
<td>dr. M.J. Waterloo</td>
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Course objective
Micrometeorology is an important tool for the assessment of exchanges of energy, water vapour and other gases between the atmosphere and the land surface. This course teaches students basic micrometeorological theory and its application, in combination with prior knowledge on soil physical and plant physiological processes, to approach current research issues related to impacts of changes in climate, land use and soil properties on the hydrological and carbon cycles.

Course content
Soil Vegetation Atmosphere Exchange deals with the micrometeorological processes that determine the basic exchange of water, energy and nutrients from the soil and vegetation to the atmosphere. The first part of the course deals with fundamental micrometeorological theory: radiation exchange, energy balance, soil heat flux, turbulent transfer, flux-profile relationships, K- theory and coupling of the land surface to the planetary boundary layer. The second part deals with measurement techniques for fluxes of heat, water, momentum and CO2, and other trace gasses. The final part of the course teaches primary principles of Soil Vegetation Atmosphere Transfer Schemes (TESSEL SVAT model) through a series of computer workshops in which hands-on experience of SVAT modeling is gained.

Type of assessment
Written examination (60 %), attendance of workshops and submission of exercises (40 %)
Course reading
Course reader and all other relevant documents are available on Blackboard.

Remarks
Follows-up on the Ecohydrology (450014) and Unsaturated Zone and Near-surface Hydrological Processes (450021) courses.

Soil-Plant Interactions

<table>
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<th>Course code</th>
<th>AM 470507 ()</th>
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<tr>
<td>Credits</td>
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<tr>
<td>Faculty</td>
<td>Fac. der Aard- en Levenswetenschappen</td>
</tr>
<tr>
<td>Coordinator</td>
<td>dr. M.P. Berg</td>
</tr>
<tr>
<td>Teaching method(s)</td>
<td>Lecture, Practical</td>
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Course objective
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.

Course content
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.

**Type of assessment**
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.

**Course reading**
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.

**Entry requirements**

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.

**Target group**
MSc students with focus on ecology.

**Spatial Analysis for Ecologists**

| Course code | AM_470513 () |
| Credits     | 6.0          |
| Language of tuition | English |
| Faculty     | Fac. der Aard- en Levenswetenschappen |
| Coordinator | ir. A.Q.A. Omtzigt |
| Teaching method(s) | Lecture, Computer lab |

**Course objective**
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.

Course content
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.

Type of assessment
Examination on theory; report on case study

Course reading

Remarks
Minimum amount of registrations for the course to take place: 10.

Spatial Ecology and Global Change

<table>
<thead>
<tr>
<th>Course code</th>
<th>AM_470502 ()</th>
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<td>Period</td>
<td>Period 1</td>
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<td>Credits</td>
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<td>Language of tuition</td>
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</tr>
<tr>
<td>Faculty</td>
<td>Fac. der Aard- en Levenswetenschappen</td>
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</tbody>
</table>
Course objective
The main aim of the course is the analysis of spatial and temporal distribution of organisms in the context of global climate change. In fact this refers to the field of biogeography.
In this course, MSc students will learn about the different vegetation zones of the earth, climate zones and climate change, biodiversity, disturbance history, ecosystem dynamics, patterns of distribution, and patterns of fauna and flora in the past and future. Special attention will be given to the range dynamics of species, that is, analysis of the factors that cause the range of a species to expand or diminish, depending on locally varying environmental factors. This course will emphasize an evolutionary and ecological approach, providing a causal explanation of the (changes) in the distribution of organisms. At the end of this course, students will have a deeper understanding of the patterns of distribution of living organisms across the earth's surface, and the underlying mechanisms.

Course content
Analysis and explanation of spatial and temporal distribution patterns comes from various scientific fields: ecology, evolution biology, phylogeny, paleontology, geology, geography, and climatology. Questions will be addressed such as why and how plant and animal species have become extinct, discussing natural and man-made causes. This is essential to understand past and present biodiversity on earth and how to preserve biodiversity. Various examples of how distributional changes relate to past and recent factors and processes will be treated. Glaciations and de-glaciations and the positioning of mountain ranges have differentially affected biodiversity of the North American and Eurasian Content. Current global change, such as global warming and sea level rise leads to similar changes in distribution patterns of plants and animals and further insight and evidence for this comes from past climate change. This course on spatial ecology and global change ecology will cover the following topics:
- Introduction to biogeography
- A history of biogeography
- Patterns of Distribution
- Patterns of Climate
- Living in the past
- Early life and moving continents
- Rise of the flowering plants
- Cretaceous and Cenozoic climate, geographic animal and floral changes
- Geography of life today
- Ice and Change
- Molecular and isotopic biogeography
- Methods of biogeographical analysis
- Paleogeography

The course will be given during 4 weeks, covering the afternoon of the first three weeks.
A first series of sessions will deal with dynamics of distribution areas and modeling; a second part consists of treatment of cases of spatial ecology of insects and invertebrate animals and the third part deals with case studies on plants and current and historic plant distributions.
Form of tuition
The textbook mentioned will be used and the teachers of this course will treat parts of this textbook. General and modeling aspects of spatial and temporal distributions of organisms will be discussed, N. M van Straalen will address patterns of distribution of animals in an evolutionary context. J. Rozema will treat the distribution of plants with particular reference to the impact of global change. Evidence of how climate change has affected plant distribution on earth will be derived from the fossil pollen record. An excursion will be made to the Naturalis Museum, Leiden, to view and study various plant and animal groups representing relevant evolutionary and present- day developments.

Relevant recent literature on this aspect will be studied and discussed. Discussion sessions will be held on each aspect. Students are asked to write an essay on one of the aspects, to prepare an oral presentation and a written examination will complete the course.

The lecturers will introduce the basic ideas and subject matter of tuition and highlight some features of the aspect to be dealt with. The students are expected to write an essay based on topics explored by self study (a. o. search for literature) and prepare an oral presentation of the content of a journal paper or book chapter, which will be discussed.

Type of assessment
Judgement and examination will be based on the essay completed, and the oral presentation (33. 3%) of the content of a journal paper or book chapter, a practical assignment (16. 7%) and a written examination (50%) on the subject matter of tuition.

Course reading

Target group
This course is obligatory for all students following the program of MSc Ecology. It will provide a basic training for various follow-up courses of choice.

Remarks
Please note: course takes place only once every two years. 2011 - 2012: yes; 2012 - 2013: no.

Sustainable Land Management

<table>
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<th>Course code</th>
<th>AM_450259 (450003)</th>
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<tr>
<td>Period</td>
<td>Ac. Year (September)</td>
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<td>Credits</td>
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<td>Language of tuition</td>
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<tr>
<td>Faculty</td>
<td>Fac. der Aard- en Levenswetenschappen</td>
</tr>
<tr>
<td>Coordinator</td>
<td>A.L. Oskam</td>
</tr>
<tr>
<td>Teaching staff</td>
<td>dr. W.R.S. Critchley, drs. S.L. Di Prima MSc, drs. W.A.M. Tuijp</td>
</tr>
<tr>
<td>Teaching method(s)</td>
<td>Seminar</td>
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</table>
Course objective
The course's main focus is on what can be done about the problems of soil erosion and land degradation and their relevance to climate change and poverty reduction: "Sustainable Land Management" is a new approach that involves people as well as technical issues. The course spans a wide range of topics, including environmental problems, history of approaches, concepts of rural development, conservation technologies in the field, working with local people, and skills in research and development in the tropics. There is a combination of theory and practice, with a strong emphasis on illustrated case studies from over 20 countries.

Course content

Form of tuition
Interactive lectures with illustrated case studies; conducted and examined in English.

Type of assessment
One topic will be chosen by each student for a paper of 3.000 words based on further reading (50% mark). There will also be a final examination (50% mark).

Course reading

Recommended background knowledge
Some background and interest in at least one of the following - Hydrology, Geology, Biology, Development Studies, Sociology

Remarks
Aimed at students with environmental and developmental interests: especially those with some geography/earth science/hydrological/biological/ecological/environmental background, but social scientists can also benefit from this course. For more information please contact Dr William Critchley (wrs.critchley@cis.vu.nl) or Wendelien Tuyp (wam.tuyp@cis.vu.nl)

System Neurosciences
Course objective
Provide insight into a systems approach to neuroscience.

Course content
Systems Neurosciences is a "way of life": approaching the study of the central nervous system in an integrated and multidisciplinary way. Once learned in an exemplar system, the systems approach can be applied to essentially any functional system in the CNS. In this course we will restudy the organization of essential systems, such as the sensory and motor systems, associational systems, autonomic nervous system and hypothalamus, etc. This will to a large extent consist of textbook-based homework assignments with short presentations and discussion. The core of the course will take examples of systems involved in learning and memory, in particular those involved in declarative learning and memory. Based on selected review-type papers/chapters we will a) follow the development of concepts over time; b) discuss the relationship between technology-development and experimental approaches c) study and discuss different approaches and d) integrate those into a concept of systems neurosciences.

Form of tuition
Lectures, homework assignments, presentations, and tutored discussions. Classes, with homework assignments, will be once every week on Tuesday from 16-19.00
- Class 1: The somato-motor system: stimulus-perception-output coupling
- Class 2: Other sensory systems: general features of cortico-thalamic interplay and attention
- Class 3: Higher order cortical integration: cognition and consciousness
- Class 4: Learning and memory: different systems, definitions
- Class 5: Molecular and cellular approaches
- Class 6: Network approaches, animal and human
- Class 7: Integration
- Class 8: Presentations of final thesis and general discussion

Type of assessment
Self-study with evaluations by way of presentations and discussions; final thesis on a self-selected topic.

Course reading
This book will be used in the course as background literature and for a large part of self study assignments. Other literature will be provided during the course or will be self-selected.

Remarks
Tuition in English. Minimum number of students: 8.