Biomedical Sciences MSc

VU University Amsterdam - Fac. der Aard- en Levenswetenschappen - M Biomedical Sciences - 2015-2016

The aim of the programme is to equip the student with the knowledge, skills and understanding required to operate as an independent professional within the disciplines covered by the Master's programme, and to be a suitable candidate for a subsequent career in biomedical research. The Master's programme in Biomedical Sciences guarantees its students in-depth research experience with a solid academic basis, combined with the communication skills that are needed to perform at the international level.

The student can choose from the following specializations:

First and/or second year Research specializations (54-60 EC):

-Immunology
-Infectious Diseases
-Neurobiology

Second year Research specializations (54-60 EC), only for students that started in study year 2014-2015 or earlier:

-Medical and Behavioural Genomics
-Psychophysiology

The I/C/S/E specializations are only available in the second year of the master:

-International Public Health (54 EC)
-Science Communication specialization (54 EC)
-Specialization Science in Society (54 EC)
-Education specialization (60 EC)

The I/C/S/E specializations are one-year programmes that cannot be combined with each other, and which must be combined with one of the research specializations.

The year schedule can be found at the FALW-website.
Further information about the MSc programme Biomedical Sciences.
A complete programme description can be found at the FALW-website.

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Expired programme components Biomedical Sciences

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

Courses:

Name	Period	Credits	Code
Clinical development and clinical trials	Ac. Year (September)	6.0	AM_470585
Qualitative and Quantitative Research Methods		6.0	AM_470582

MSc Biomedical Sciences, Research Specializations year 1 and/or 2

The prescribed scope of the research specializations is 54-60 EC, including:
• research internship (30 EC)
• at least 3 courses from the specialization (18 EC)
• choice (6-12EC) from:
o literature thesis in the field of the specialization (9 EC);
o an extra optional course of the specialization (6 EC)
o an extension of the internship (3-6 EC)*
* The total EC for both internships together may not exceed 66EC.

When the student chooses one research specialization, the subject of the literature thesis has to lie within the field of specialization (9 EC).

The programme is completed with the compulsory general courses (6 EC), other specialization courses (24 EC) and a second research internship (30 EC).

First and/or second year Research specializations (54-60 EC):
Immunology
Infectious Diseases
Neurobiology

Second year Research specializations (54-60 EC), only for students that started in study year 2014-2015 or earlier:
Medical and Behavioural Genomics
Psychophysiology

Programme components:

- Specialization Immunology
- Specialization Infectious Diseases
- Specialization Neurobiology

Specialization Immunology

The Master's graduate with a specialization in Immunology has a broad understanding of immunological processes, ranging from the molecular and cellular interactions between host and pathogen to an integrative

knowledge of the role of the immune system in various pathologies, such as cancer, infectious diseases and autoimmunity. The Master's graduate has specialized in one of the subjects within the field of immunology. He/she possesses knowledge of current theory and the key research questions in the field of immunology and has an understanding of the scientific and social relevance of this subject area.

The prescribed scope of the research specializations is 54-60 EC, including:
• research internship (30 EC)
• at least 3 courses from the specialization (18 EC)
• choice (6-12EC) from:
o literature thesis in the field of the specialization (9 EC);
o an extra optional course of the specialization (6 EC)
o an extension of the internship (3-6 EC)*
* The total EC for both internships together may not exceed 66EC.

The course programme consists of the following components, with the study load for each component given in EC.

Programme components:

- compulsory modules
- choose at least 2 of these courses

compulsory modules

Courses:

Name	Period	Credits	Code
Advanced Molecular Immunology and Cell Biology	Period 1	6.0	AM_470656
Internship Immunology	Ac. Year (September)	30.0	AM_471137

choose at least 2 of these courses

Courses:

Name	Period	Credits	Code
Clinical Immunology	Period 2	6.0	AM_470655
Immunity and Disease	Period 1	6.0	AM_1031
Molecular Infection Biology	Period 2	6.0	AM_470657

Specialization Infectious Diseases

The Master's graduate with a specialization in Infectious diseases has a broad understanding of the biology of pathogenic organisms and the interaction between pathogens and their hosts. The Master's graduate has the ability to conduct scientific research in the field of medical

microbiology and to critically assess the results of microbial research. The Master's graduate has specialized in one of the subjects within the field of medical microbiology. He/she possesses knowledge of current theory and the key research questions in this field and has an understanding of the scientific and social relevance of this subject area.

The prescribed scope of the research specializations is 54-60 EC, including:
• research internship (30 EC)
• at least 3 courses from the specialization (18 EC)
• choice (6-12EC) from:
o literature thesis in the field of the specialization (9 EC);
o an extra optional course of the specialization (6 EC)
o an extension of the internship (3-6 EC)*
* The total EC for both internships together may not exceed 66EC.

The course programme consists of the following components, with the study load for each component given in EC.

Programme components:

- compulsory modules
- at least 6 EC to be obtained

compulsory modules

Courses:

Name	Period	Credits	Code
Advanced Molecular Immunology and Cell Biology	Period 1	6.0	AM_470656
Internship Infectious Diseases	Ac. Year (September)	30.0	AM_471138
Molecular Infection Biology	Period 2	6.0	AM_470657

at least 6 EC to be obtained

Courses:

Name	Period	Credits	Code
Containment Strategies of Infectious Diseases in Global Context	Period 1	6.0	AM_470127
Health Geography	Period 2	6.0	AM_470094
Microbial Genomics	Period 3	3.0	AM_1021
Parasitology		6.0	AM_1055
Parasitology	Period 2	6.0	AM_470052
Viral Oncogenesis	Period 4	3.0	M_OVIRONC03

Specialization Neurobiology

The prescribed scope of the research specializations is 54-60 EC, including:
• research internship (30 EC)
• at least 3 courses from the specialization (18 EC)
• choice (6-12EC) from:
o literature thesis in the field of the specialization (9 EC);
o an extra optional course of the specialization (6 EC)
o an extension of the internship (3-6 EC)*
* The total EC for both internships together may not exceed 66EC.

The course programme consists of the following components, with the study load for each component given in EC.

Programme components:

- Optional Courses Neurobiology: choose 2
- Compulsory courses Neurobiology

Optional Courses Neurobiology: choose 2

Courses:

Name	Period	Credits	Code
Developmental Neurobiology of the Vertebrate Brain	Period 2	6.0	AM_470713
Live Cell Imaging	Period 1	6.0	AM_470726
Methods in Behavioral Neurosciences	Period 1	6.0	AM_470728
Neuronal Networks in Vivo	Period 2	6.0	AM_1001

Compulsory courses Neurobiology

Courses:

Name	Period	Credits	Code
Advanced Molecular Immunology and Cell Biology	Period 1	6.0	AM_470656
Internship Neurobiology	Ac. Year (September)	30.0	AM_1178
System Neurosciences	Period 2	6.0	AM_470712

MSc Biomedical Sciences, Research Specializations year 2

Programme components:

- Specialization Medical and Behavioral Genomics
- Specialization Psychophysiology

Specialization Medical and Behavioral Genomics

The Master's graduate with a specialization in Medical and Behavioral Genomics (only for students that started in study year 2014-2015 or earlier) has an understanding and knowledge of the application of genomics in studying complex disorders and traits, including mental health and neurodevelopmental disorders. In this rapidly developing field, the student's knowledge covers basic classical genetics and biometrical approaches, genetic epidemiology and genetic association and linkage methods. Skills include application of these methods not only to data from genetics and genomics platforms, but also from gene expression (transcriptomics) and endophenotypes.

The prescribed scope of the research specializations is 54-60 EC, including:
• research internship (30 EC)
• at least 3 courses from the specialization (18 EC)
• choice (6-12EC) from:
o literature thesis in the field of the specialization (9 EC);
o an extra optional course of the specialization (6 EC)
o an extension of the internship (3-6 EC)*
* The total EC for both internships together may not exceed 66EC.

The course programme consists of the following components, with the study load for each component given in EC.

Programme components:

- compulsory module

compulsory module

Courses:

Name	Period	Credits	Code
Complex Trait Genetics	Period 2	6.0	AM_470733
Genomic Data Analysis	Period 2	6.0	AM_1008
Internship Med. and Behavioural Genomics	Ac. Year (September)	30.0	AM_471142
Statistical Genetics for Gene Finding	Period 1	6.0	AM_1040

Specialization Psychophysiology

The Master's graduate with a specialization in Psychophysiology (only for students that started in study year 2014-2015 or earlier) has a broad understanding of the functions of the central and peripheral

nervous system and a special knowledge of the measurement of these functions through physiological recording techniques (cardiovascular, EEG, MRI, hormones). The Master's graduate has the ability to conduct scientific research in the field of psychophysiology and to critically assess the results of psychophysiological research. The Master's graduate has specialized in one of the subjects within the field of psychophysiology. He/she possesses practical skills in psychophysiological measurement and has knowledge of current theory and the key research questions in this field. She/he has an understanding of the scientific and social relevance of this subject area.

The prescribed scope of the research specializations is 54-60 EC, including:
• research internship (30 EC)
• at least 3 courses from the specialization (18 EC)
• choice (6-12EC) from:
o literature thesis in the field of the specialization (9 EC);
o an extra optional course of the specialization (6 EC)
o an extension of the internship (3-6 EC)*
* The total EC for both internships together may not exceed 66EC.

The course programme consists of the following components, with the study load for each component given in EC.

Programme components:

- MSc Biomedical Sciences, spec. Psychophysiology
- MSc Biomedical Sciences, spec. Psychophysiology

MSc Biomedical Sciences, spec. Psychophysiology

Courses:

Name	Period	Credits	Code
Internship Psychophysiology	Ac. Year (September)	30.0	AM_471140

MSc Biomedical Sciences, spec. Psychophysiology

Courses:

Name	Period	Credits	Code
Advanced Human Neurophysiology	Period 2	6.0	AM_1003
Experimental and Clinical Neuroendocrinology	Period 2	6.0	AM_470700
Functional Brain Imaging	Period 1	6.0	AM_470715
Psychophysiology	Period 1	6.0	AM_470736

MSc Biomedical Sciences, Second Year ICSE Specializations

The I/C/S/E specializations are only available in the second year of the master:
International Public Health (54 EC)
Science Communication specialization (54 EC)
Specialization Science in Society (54 EC)
Education specialization (60 EC)

Based on the assumption that Master's students following an ICSE specialization should also have research experience, the research specialization consists of at least 57 EC and should include a biomedical research internship (30EC).

Programme components:

- Communication Specialization
- Education specialization Biology
- Specialization International Public Health
- MSc Biomedical Sciences, Specialisation Science in Society

Communication Specialization

Biomedical science is increasingly becoming an interdisciplinary research field in which biomedical scientists can no longer function effectively in isolation. Rather, they benefit from interaction with other scientists (such as those in the fields of molecular biology, neurobiology and immunobiology) and societal actors (such as doctors, patients and policymakers). Communication about science takes place between academic peers and between scientists and the general public. This makes the Communication specialization a complex and dynamic field of research and practice, for example on patient participation in health research, the use and effects of media metaphors and hype, and public understanding of emergent technologies. The Master's graduate with this specialization has a theoretical understanding of the complex problems that arise during such communication processes, and has developed the necessary skills to act professionally at this interface to enhance communication and the outcomes of communication between scientific actors and society.

The prescribed scope of the Communication specialization is 54 EC, including:
o Internship (30 EC)
o At least 4 courses from the specialization (24 EC)

Programme components:

- Compulsory courses
- Choose at least two of these courses
- Choose one of these courses

Compulsory courses

Courses:

Name	Period	Credits	Code
Research methods for analyzing complex problems	Period 1	6.0	AM_1182
Science and Communication	Period 1	6.0	AM_470587

Choose at least two of these courses

Courses:

Name	Period	Credits	Code
Communication, Organization and Management	Period 2	6.0	AM_470572
Science in Dialogue	Period 2	6.0	AM_1002
Science Journalism	Period 2	6.0	AM_471014
Science Museology	Period 3	6.0	AM_470590

Choose one of these courses

Courses:

Name	Period	Credits	Code
Reflective Practice Internship Science Communication	Ac. Year (September)	30.0	AM_1163
Research Internship Science Communication	Ac. Year (September)	30.0	AM_1162
Research methods for analyzing complex problems	Period 1	6.0	AM_1182
Science and Communication	Period 1	6.0	AM_470587

Education specialization Biology

The Master's graduate with a specialization in Education obtains a certificate that qualifies the graduate to teach Biology in secondary schools (this is a 'grade one' certificate, i.e. it qualifies the graduate to teach pupils who will sit public exams in the subject).

The programme for the Education specialization essentially consists of one year of specific teacher training. This 60 EC-programme is taught in Dutch. Note that the Education Specialization is identical to the Master's in 'Leraar Voorbereidend Hoger Onderwijs - Biologie' that can be followed in addition to a research Master's in Biology or the Biomedical Sciences. The programme can be started twice a year, in September and February.
For courses and more information on the Education specialization:

www.psy.vu.nl/nl/opleidingen/masteropleidingen/universitaire-lerarenopleiding.

The prescribed scope of the Education specialization is 60 EC

Programme components:

- Master Leraar VHO Biologie 2015
- LVHO Biologie, overgangsregels
- Leraar voorbereidend hoger onderwijs in Biologie verplicht

Courses:

Name	Period	Credits	Code
Internship Educational Specialisation	Ac. Year (September)	30.0	AM_471143

Master Leraar VHO Biologie 2015

Courses:

Name	Period	Credits	Code
Didactiek 1	Period 1, Period 4	6.0	O_MLDIDAC_1
Didactiek 2	Period 2+3, Period 5+6	6.0	O_MLDIDAC_2
Didactiek 3	Period 4+5+6	9.0	O_MLDIDAC_3
Peergroup 1	Period 1+2+3, Period 4+5+6	0.0	O_MLPEERGR_1
Peergroup 2	Period 3+4+5	0.0	O_MLPEERGR_2
Praktijk 1	Period 1, Period 4	6.0	O_MLPRAK_1
Praktijk 2	Period 2+3, Period 5+6	9.0	O_MLPRAK_2
Praktijk 3	Period 4+5+6	15.0	O_MLPRAK_3
Praktijk onderzoek 1	Period 3, Period 6	3.0	O_MLPROZ_1
Praktijk onderzoek 2	Period 4+5+6	6.0	O_MLPROZ_2

LVHO Biologie, overgangsregels

Courses:

Name	Period	Credits	Code
Educational and Pedagogical Studies I	Period 1+2	6.0	O_MLADEPI
Research I	Period 1+2+3	3.0	O_MLVPOOI
Teaching Methodology Biology I	Period 1+2	3.0	O_MLVDBII
Teaching Practice I	Period 1+2+3	15.0	O_MLPRAKI

Leraar voorbereidend hoger onderwijs in Biologie verplicht

Courses:

Name	Period	Credits	Code
Educational and Pedagogical Studies II	Period 1+2	3.0	O_MLADEPII
Research II	Period 1+2+3	6.0	O_MLVPOOII
Specialisation	Period 2+3	3.0	O_MLVERD
Teaching Methodology Biology II	Period 1+2	6.0	O_MLVDBIII
Teaching Practice II	Period 1+2+3	15.0	O_MLPRAKII

Specialization International Public Health

The Master's graduate with a specialization in International public health has a broad understanding of current and future challenges in international public health, their main causes, and applied and potential interventions. The Master's graduate has specialized knowledge of relevant concepts from various disciplines, including epidemiology, policy science, anthropology, management studies, biomedical sciences and health sciences. The Master's graduate has the ability to conduct scientific research in the field of international public health and to critically assess the results of international public health research. The Master's graduate has specialized in one of the subjects within the field of international public health. He/she possesses knowledge of current theory and the key research questions in this field and has an understanding of the scientific and social relevance of this subject area.

The prescribed scope of the IPH specialization is 54 EC, including:
o Internship (30 EC)
o At least 4 courses from the specialization (24 EC)

A course in epidemiology (6 EC) is compulsory to be admissible to this specific specialization. VU-students with a deficiency in epidemiology can obtain the relevant knowledge through the bachelor's course 'Epidemiology', external students can contact the master's coordinator or specialization coordinator for options.

Programme components:

- MSc Biomedical Sciences, spec. International Public Health
- MSc Biomedical Sciences, spec. International Public Health

MSc Biomedical Sciences, spec. International Public Health

Courses:

Name	Period	Credits	Code

Containment Strategies of Infectious Diseases in Global Context	Period 1	6.0	AM_470127
Internship International Public Health	Ac. Year (September)	30.0	AM_471139
Policy, Management and Organisation in International Public Health	Period 2	6.0	AM_470819
Research Methods for Need Assessments	Period 1	6.0	AM_470817

MSc Biomedical Sciences, spec. International Public Health

Courses:

Name	Period	Credits	Code
Disability and Development	Period 2	6.0	AM_470588
Health, Globalisation and Human Rights	Period 2	6.0	AM_470818
International Comparative Analyses of Health Care Systems	Period 3	6.0	AM_470820

MSc Biomedical Sciences, Specialisation Science in Society

The Master's graduate with a specialization Science in Society combines an academic approach with the skills and competences that will allow him or her to perform scientific research at the interface of the biomedical sciences and society. The specialization aims to develop strategies that contribute to an understanding of complex societal problems and strategies to solve complex societal problems through interdisciplinary research. In addition, the programme analyses the social, economic and ethical aspects of new developments in the biomedical sciences, so as to assess their implications for society. Master's graduates have the necessary skills to collaborate and communicate with researchers from various scientific disciplines (including but not limited to those in the life sciences) and societal actors, and the ability to use these academic insights.

The prescribed scope of the Science in Society specialization is 54 EC, including:
o Internship (30 EC)
o At least 4 courses from the specialization (24 EC)

Programme components:

- MSc BMED spec. Science in society - compulsory courses
- Choose at least one of these courses

MSc BMED spec. Science in society - compulsory courses

Courses:

Name	Period	Credits	Code
Analysis of Governmental Policy	Period 1	6.0	AM_470571
Communication, Organization and Management	Period 2	6.0	AM_470572
Internship Science in Society	Ac. Year (September)	30.0	AM_1133

Choose at least one of these courses

Courses:

Name	Period	Credits	Code
Business Management in Health and Life Sciences	Period 2	6.0	AM_470584
Clinical Development and Clinical Trials	Period 3	3.0	AM_1180
Disability and Development	Period 2	6.0	AM_470588
Entrepreneurship in Health and Life Sc.	Period 2	6.0	AM_470575
Epidemiology	Period 3	3.0	AM_1179
Health, Globalisation and Human Rights	Period 2	6.0	AM_470818
Policy, Politics and Participation	Period 2	6.0	AM_470589
Science in Dialogue	Period 2	6.0	AM_1002

MSc Biomedical Sciences, compulsory courses

Courses:

Name	Period	Credits	Code
Ethics in Life Sciences	Period 3	3.0	AM_470707
Literature thesis Biomedical Sciences	Ac. Year (September)	9.0	AM_471135
Scientific Writing in Engl (AM_BIO&BMED)	Period 2	3.0	AM_1161A
Scientific Writing in Engl (AM_BMED)	Period 3+4	3.0	AM_1161B

Internship for students without spec.

Courses:

Name	Period	Credits	Code
Internship Biomedical Sciences- no spec.	Ac. Year (September)	30.0	AM_471158

Advanced Human Neurophysiology

Course code	AM_1003 ()
Period	Period 2
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	dr. K. Linkenkaer Hansen
Examinator	dr. K. Linkenkaer Hansen
Teaching staff	dr. K. Linkenkaer Hansen
Teaching method(s)	Lecture, Study Group, Computer lab, Practical
Level	600

Course objective
At the end of the course the student should be able to:
1. Explain how the human brain generates scalp electroencephalographic (EEG) signals, both ongoing oscillations and event-related potentials (ERPs).
2. Acquire practical experience with EEG (i.e., measure EEG, perform quantitative and statistical analysis to draw conclusions about the relation between brain activity and cognition/behavior, and present the results on a poster).
3. Explain key concepts of complex-systems science that have gained acceptance in the cognitive and behavioral neurosciences.
4. Apply state-of-the-art complexity-analysis techniques to M/EEG data and perceptual/behavioral time series, and
5. …understand how these techniques can be applied in various scientific and medical fields, including sleep research, brain-computer interfacing, and genetics.
6. Explain the advanced techniques that estimate brain sources from the EEG signals, and outline the possibilities and limitations based on own experiences.
7. Explain the rationale of so-called "integrated biomarkers", use specialized toolboxes to compute them and critically reflect on the pros and cons of this approach to functionally assess the state of a human brain based on the rhythms that it generates.

Course content
Understanding the complexity of the human brain and mind is one of the greatest scientific challenges of the 21st century. To address these challenges, researchers increasingly adopt theories and methods used to study complexity in other natural systems. In this course, we give you a solid conceptual understanding of "complexity" and tools to study the

complexity of the human brain through quantitative analysis of the brain rhythms that it generates and the variability in cognitive and behavioral tasks.
We consider it critical that students gain an in-depth understanding of the analytical tools in order to properly use and interpret the outcome of the different analysis techniques. This is achieved by covering the theory in the lectures followed by tutorials in the computer rooms. The concepts of "critical dynamics" and power-law scaling behavior are carefully explained in the context of time-series analysis tools, generating mechanisms, and functional implications. Key concepts of complex networks and analytical tools to characterize them based on M/EEG data are also covered.
Another important component of the course is to teach you how to perform high-density EEG recordings of spontaneous brain activity during resting-state conditions and cognitive tasks and to analyze these signals with classical as well as modern complexity algorithms. You will work in small groups to record, analyze and present both data on EEG and its cognitive/behavioral correlates at the end of the course.
Finally, the importance of non-stimulus driven brain activity and cognition for brain-related disorders such as depression, dementia, insomnia or attention deficit and hyperarousal disorder is discussed in the context of normal variation in biomarkers and the associated challenges in objective diagnosis, prognosis, and treatment selection. We explain how data-mining and -classification techniques from artificial intelligence can be used to integrate information from multiple biomarker algorithms to increase the accuracy of clinically relevant functional assessments. While the course is focused on understanding variability in human cognition and behavior in health and disease, the concepts and tools equally apply to research on common animal models.

Form of tuition
The study credits amount to 168 hours of study, which are divided approximately as follows:

Activity Hours of study
Lectures 20
Self study (literature and lecture sheets) 40
Lab experiments 8
Data analysis and computer practicals 32
Group discussions (journal club preparation) 4
Plenary discussions 6
Poster preparation 18
Preparation for exams (poster and written) 40
Total 168

Type of assessment
EEG/ERP data collection under supervision; analysis and presentation of data on research poster (40%). Written examination (60%). Compensation is not possible.

Course reading
Nikulin VV, Linkenkaer-Hansen K, Nolte G, Lemm S, Müller KR, Ilmoniemi RJ, Curio G. A novel mechanism for evoked responses in the human brain. Eur J Neurosci. 2007;25:3146–54.

Mazaheri A, Jensen O. Asymmetric amplitude modulations of brain oscillations generate slow evoked responses. J Neurosci 2008;28:7781–7.

Jensen O, van Dijk H, Mazaheri A. Amplitude asymmetry as a mechanism for the generation of slow evoked responses. Clin Neurophysiol 2010.

Nikulin VV, Linkenkaer-Hansen K, Nolte G, Curio G. Non-zero mean and asymmetry of neuronal oscillations have different implications for evoked responses. Clin Neurophysiol 2010;121:186–93.

Hardstone R, Poil S-S, Schiavone G, Jansen R, Nikulin VV, Mansvelder HD, Linkenkaer-Hansen K. Detrended fluctuation analysis: A scale-free view on neuronal oscillations. Frontiers in Physiology. 3:450. doi:10.3389/fphys.2012.00450. 2012.

De Geus EJC (2002) Introducing genetic psychophysiology. Biol Psychol 61:1–10.

De Geus E (2010) From genotype to EEG endophenotype: a route for post-genomic understanding of complex psychiatric disease? Genome Medicine 2:1–4.

Annotated sheets from lectures

Recommended background knowledge
Brein en Medicijn

Target group
Masters and PhD students with interest in human brain function in general and EEG methodology in particular.

Advanced Molecular Immunology and Cell Biology

Course code	AM_470656 ()
Period	Period 1
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	prof. dr. M. van Egmond
Examinator	prof. dr. M. van Egmond
Teaching staff	drs. K. Brouwer, prof. dr. R.E. Mebius, dr. T. van der Pouw Kraan, prof. dr. H.E. de Vries, prof. dr. M. van Egmond, dr. ing. S.J. van Vliet
Teaching method(s)	Lecture, Study Group
Level	500

Course objective
To acquire insight into:
• cellular interactions within the immune system and how molecular diversity is generated to regulate immune responses.
• the various strategies of host immune responses against pathogens, and how pathogens escape proper immune responses.
• the various strategies of the host to positively or negatively affect immune responses during cancer.
• mechanisms by which the immune system regulates either immune activation or tolerance induction.
• the mechanism of cell migration within the immune system.
End terms:

Knowledge: Knowledge: At the end of the course the student is familiar with current knowledge on the (molecular) pathways involved in the induction and regulation of immune responses in health and disease.
Skills:
- The student is capable of applying the acquired knowledge and can interpret scientific literature and scientific hypotheses of each of the topics described above.
- The student is able to formulate a scientific hypothesis and can design a research proposal addressing the hypothesis.
- The student is able to present and discuss the research proposal with peers.

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 lies 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. Because this is an advanced course in the field of immunology, and 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 (H; 22 hours) and study groups (W; 14 hours). 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. State of the art will be discussed of all topics, which will facilitate the study of scientific articles.
Additionally, there is time for self study as well as time to design a research proposal (pro; 4 hours), which will be presented. The first three weeks
include lectures, study groups, self study and preparation and presentation of the research proposal, whereas the last week mainly covers self study and the exam.
Contact hours with teachers and/ or coordinators: 40

Type of assessment
A written exam (T) at the end of week 4 includes assay (‘open’) (90% of grade). A minimum score of 5.5 for the written exam is required in order to pass.
The research proposal (Pres) has to be presented and accounts for 10% of the grade.

Course reading
Lectures, reviews and scientific papers are part of the material that covers the exam.

Titles reviews and scientific papers (some changes may occur, final list will be posted on BB)
Reviews
1. Rossi M, Young JW. Human dendritic cells: potent antigen-

presenting cells at the crossroads of innate and adaptive immunity. J Immunol. 2005 Aug 1;175(3):1373-81.
2. Sallusto F, Mackay CR. Chemoattractants and their receptors in homeostasis and inflammation. Curr Opin Immunol. 2004 Dec;16(6):724-31.
3. Kumar H, Kawai T, Akira S. Pathogen recognition by the innate immune system. Int Rev Immunol. 2011 Feb;30(1):16-34.
4. van de Pavert SA, Mebius RE. New insights into the development of lymphoid tissues. Nat Rev Immunol. 2010 Sep;10(9):664-74.
5. De Libero G et al., How the immune system detects lipid antigens. Prog Lipid Res. 2010 Apr;49(2):120-7. doi: 10.1016/j.plipres.2009.10.002. Epub 2009 Oct 24.
6. Surana NK, Kasper DL., The yin yang of bacterial polysaccharides: lessons learned from B. fragilis PSA. Immunol Rev. 2012 Jan;245(1):13-26.
7. Abbott NJ, Rönnbäck L, Hansson E. Astrocyte-endothelial interactions at the blood-brain barrier. Nat Rev Neurosci. 2006 Jan;7 (1):41-53.
8. Bevan MJ. Helping the CD8(+) T-cell response. Nat Rev Immunol. 2004 Aug;4(8):595-602.
9. Drew M. Pardoll. The blockade of immune checkpoints in cancer immunotherapy. Nature Reviews Cancer 12, 252-264 (2012)
10. Hansson GK, Libby P. The immune response in atherosclerosis: a double-edged sword. Nat Rev Immunol. 2006 Jul;6(7):508-19.
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Research articles
1. Marsland BJ, Bättig P, Bauer M, Ruedl C, Lässing U, Beerli RR, Dietmeier K, Ivanova L, Pfister T, Vogt L, Nakano H, Nembrini C, Saudan P, Kopf M, Bachmann MF. CCL19 and CCL21 induce a potent proinflammatory differentiation program in licensed dendritic cells.
2. Joffre OP, Sancho D, Zelenay S, Keller AM, Reis e Sousa C. Efficient and versatile manipulation of the peripheral CD4+ T-cell compartment by antigen targeting to DNGR-1/CLEC9A. Eur J Immunol. 2010 May;40(5):1255-65.
3. Rangel-Moreno J, Carragher DM, de la Luz Garcia-Hernandez M, Hwang JY, Kusser K, Hartson L, Kolls JK, Khader SA, Randall TD. The development of inducible bronchus-associated lymphoid tissue depends on IL-17. Nat Immunol. 2011 Jun 12;12(7):639-46.
4. Reboldi A. et al., C-C chemokine receptor 6–regulated entry of TH-17 cells into the CNS through the choroid plexus is required for the initiation of EAE. Nat Immunol. 2009 May;10(5):514-23. doi: 10.1038/ni.1716. Epub 2009 Mar 22.
5. Feau S, Arens R, Togher S, Schoenberger SP. Autocrine IL-2 is required for secondary population expansion of CD8(+) memory T cells. Nat Immunol. 2011 Jul 31;12(9):908-13.
6. Sierra JR, Corso S, Caione L, Cepero V, Conrotto P, Cignetti A, Piacibello W, Kumanogoh A, Kikutani H, Comoglio PM, Tamagnone L, Giordano S. Tumor angiogenesis and progression are enhanced by Sema4D produced by tumor-associated macrophages. J Exp Med. 2008 Jul 7;205 (7):1673-85.
7. Medina RJ, O'Neill CL, Sweeney M, Guduric-Fuchs J, Gardiner TA, Simpson DA, Stitt AW.
Molecular analysis of endothelial progenitor cell (EPC) subtypes reveals two distinct cell populations with different identities. BMC Med Genomics. 2010 May 13;3:18.
8. Coffelt SB, Lewis CE, Naldini L, Brown JM, Ferrara N, De Palma M. Elusive identities and overlapping phenotypes of proangiogenic myeloid

cells in tumors. Am J Pathol. 2010 Apr;176(4):1564-76.

Entry requirements
Solid knowledge on basic immunology is compulsory before the start of the course.

Recommended background knowledge
A bachelor's course immunology is recommended.

Target group
Students with a keen interest to study immunological processes that form a basis for a variety of occurrences of diseases. In particular those that cover the interaction between host-pathogen, host–tumor and homeostatic control.

Remarks
Study groups and active participation are compulsory. A substitution assignment is required when one or more workshops have not been attended, or when participation is judged as unsatisfactory.

Analysis of Governmental Policy

Course code	AM_470571 ()
Period	Period 1
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	M.J. Kishna
Examinator	prof. dr. J.T. de Cock Buning
Teaching staff	prof. dr. J.T. de Cock Buning
Teaching method(s)	Lecture, Study Group, Computer lab
Level	500

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 psychologal 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
Analysis of Governmental Policy is a fulltime course of four weeks (6 ECTS). The most recent course schedule is to be found on Blackboard. Tuition methods include lectures, training workshops, and self-study. The different elements have the following study time:
- lectures: 15 hours
- project and self-study: remaining hours (within the project: 18x 1 hour coach meeting)
- examination: 2 hours

Please note that attendance to the project meetings is compulsory. Attendance to the lectures is highly recommended. In our experience, relying on self-study alone is insufficient to pass the exam

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%)). All parts have to be passed successfully.

Course reading
Buse, Mays and Walt: "Making Health Policy" McGrawHill/Open University press. (at least 2nd edition 2012).

Recommended background knowledge
The project integrates the learned lessons from the first compulsory MPA courses: Qualitative & Quantitative Methods.\

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 teams will be coached by workgroup leaders.

Business Management in Health and Life Sciences

Course code	AM_470584 ()
Period	Period 2
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	prof. dr. H.J.H.M. Claassen
Examinator	prof. dr. H.J.H.M. Claassen
Teaching staff	prof. dr. H.J.H.M. Claassen
Teaching method(s)	Lecture, Computer lab
Level	500

Course objective
To acquire knowledge and understanding into theory of knowledge valorisation in health and life sciences
To acquire knowledge and insight in how to organise, protect and finance a business in health and life sciences
3To acquire knowledge and understanding into the pharmaceutical industry's business model and business processes
To acquire knowledge and understanding into the challenges that face the pharmaceutical industry
To apply newly acquired knowledge and understanding in writing a business plan
To apply newly acquired knowledge and understanding by solving case examples
To reflect on and critically evaluate the role of the pharmaceutical industry in the healthcare system
To learn to autonomously write a business plan

Course content
As a result of external factors (for example ageing of the population), it is being stated that our healthcare system is under pressure. As a central stakeholder in this healthcare system, the pharmaceutical industry is facing significant challenges the coming years and more than ever, the pharmaceutical industry is challenged to survive. Business Management in the Health and Life Sciences focuses on gaining insight in the pharmaceutical industry, its business model, business processes, challenges, as well as strategies and actions to overcome these challenges.

During the course, prof.dr. Eric Claassen (http://www.falw.vu.nl/en/research/athena-institute/staff/claassen.asp) together with highly experienced guest lecturers from the field will teach theoretical and practical knowledge during lectures and seminars. Tangible subjects that will be discussed during the lectures and seminars include the pharmaceutical industry's business model and business processes, 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 newly acquired knowledge is tested via an assignment (during which students will write either a personal career business plan or a 'real' business plan) and a written exam, both counting for 50% of the final grade.

Form of tuition
Lectures:35h
Assignment: 4h
Work on assignment (self study): 40h
Self-study: remaining hours

Type of assessment
Written exam: 50%
Personal Business Plan: 50%
Both have to be passed

Course reading
• Osterwalder, A. & Pigneur, Y. (2009). Business model generation. Self-published.
• Kubr, Marchesi & Ilar (McKinsey & company). (1998). Starting up. Achieving success with professional business planning. McKinsey & Company, Inc. The Netherlands, Amstel 344, 1017 AS Amsterdam.

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
Guest lecturers/organisations:
• Robert Al, TU Eindhoven
• Tamar Weenen, VU university
• Esther Pronker, VU university
• Patrick de Boer & Jochem Bosschenbroek, Ttopstart BV
• Bart van Weezenbeek
• Bart Bergstein, Forbion Capital partners
• Michael Mellink & Majorie Soeter, Odgersberndtson
• Marga Janse, innovatief LerenLeren BV
• NL Octrooicenrtum
• Price Waterhouse Coopers
• AsjesBisseling Belastingadviseurs
• And others to be announced

Clinical development and clinical trials

Course code	AM_470585 ()
Period	Ac. Year (September)
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	prof. dr. H.J.H.M. Claassen
Examinator	prof. dr. H.J.H.M. Claassen
Teaching staff	prof. dr. H.J.H.M. Claassen
Teaching method(s)	Lecture, Computer lab, Study Group
Level	500

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: ‘Life Cycle of a Clinical Trial’, ‘Clinical Trial Methodology’, ‘ICH-GCP Principles’, ‘The Ethics Committee’, ‘Safety Considerations in Clinical Trials’, ‘Quality Control & Quality Assurance’, ‘Compliance, Misconduct & Fraud’.
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 computer-based sessions) and how to interpret the results critically.

Form of tuition
Lectures:25h
(Computer) workgroup: 32h
Preparing the exam: 2h

Type of assessment
Written exam: 100%

Course reading
Will be announced on Blackboard 1 month before the start of the course

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
Guest lecturers/organisations:
• Eric Klaver
• DOCS
• Others to be announced

Clinical Development and Clinical Trials

Course code	AM_1180 ()
Period	Period 3
Credits	3.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	prof. dr. H.J.H.M. Claassen
Examinator	prof. dr. H.J.H.M. Claassen
Teaching method(s)	Lecture, Study Group
Level	500

Course objective
- to gain knowledge and insight into the function of clinical trials
- to gain knowledge and insight into the design of clinical trials
- to gain knowledge and insight into the conduct of clinical trials, including the applying rules and regulations (including ICH-GCP)
- to gain knowledge and insight into and reflect on the roles, tasks and responsibilities of the stakeholders involved in clinical trials
- to reflect on the role of golden standard in our healthcare system
- to learn where and how to look up rules and regulations.

Course content
In today's healthcare system, clinical trials have gained the status of golden standard to test the safety and efficacy of newly developed drugs. For new drugs to enter the market, clinical trials must be passed and as a consequence, clinical trial outcomes have major effects on our healthcare system. While our healthcare system currently is under pressure to remain affordable and available to all, at the same time, clinical trial regulations are increasingly tightened and the prominence of clinical trials in our healthcare system is being criticized. For that matter, it is of great importance to learn about and reflect on the role of clinical trials in today's healthcare system.

The Clinical Development & Clinical Trials course will elaborate on the function, design and conduct of clinical trials, as well as the relevant stakeholders involved. The course consists of a theoretical part and an important practical part (e.g. gaining knowledge on clinical trial regulations). Classes include for example: 'Life Cycle of a Clinical Trial', 'Clinical Trial Methodology', 'ICH-GCP Principles', 'The Ethics Committee', 'Safety Considerations in Clinical Trials', 'Quality Control & Quality Assurance', 'Compliance, Misconduct & Fraud'.

The gained knowledge and skills will be evaluated by means of a written exam at the end of the course.

Form of tuition
Lectures: 35 h.
Self study: remaining hours

Type of assessment
Written exam: 100%.

Course reading
Will be announced on Blackboard 1 month before the start of the course.

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
Guest lecturers/organisations:
• Eric Klaver
• DOCS
• Others to be announced.

Clinical Immunology

Course code	AM_470655 ()
Period	Period 2
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	dr. T. van der Pouw Kraan
Examinator	prof. dr. Y. van Kooyk
Teaching staff	drs. K. Brouwer, dr. C.J.J. Mulder, dr. T. van der Pouw Kraan, dr. B.W. van Oosten, dr. J. Killestein, prof. dr. P. van der Valk, dr. ing. S.J. van Vliet, dr. E.J.G. Peters, H.E. Hulst
Teaching method(s)	Lecture
Level	500

Course objective
To understand immunopathogenic processes that play a role in the onset and chronicity of three immunological diseases, which cover auto-immunity and infectious disease, such as celiac disease, multiple sclerosis (MS) and AIDS.
To acquire insight in both clinical parameters as well as basic scientific principles that play a role in these diseases.
To acquire insights in the currently used treatments to reduce disease activity.
To understand the mechanism by which the immune system regulates these diseases, and how one could modify immune response to the benefit of the patient.
To apply the acquired knowledge of scientific literature and scientific hypotheses of each of the topics described above by presenting it to their fellow students.

Course content
During the course three immunological diseases will be discussed: celiac disease, multiple sclerosis (MS) and AIDS, each for the duration of one week. Each week will start with a clinical introduction into the features of the disease by a practicing clinician at the VUmc, who illustrates the symptoms in patients that have these diseases. Questions will be formulated and within small groups students will formulate answers through literature search. During the week more lectures will be given on the immunological mechanisms that play a role during these complex diseases. These lectures highlight molecular immunological tools used, as well as novel strategies such as genomics-proteomics profiling of the disease, the use of animal models that mimic disease, as well as vaccine development and treatment methodology of the diseases. Through self study and searching literature, students will try to answer the questions via an oral presentation for their fellow students, which is scheduled at each Friday.

Form of tuition
The course covers immunological processes as well as clinical parameters both at the molecular as well as the cellular level and will discuss both innate and adaptive immune responses. The course consists of lectures, selfstudy, and workshops. Lectures and workshops both are compulsory. In the latter part students will present their answers on questions based on literature searching and reading of reviews as well as the lectures. For the duration of one week one disease will be discussed, whereas the last week covers mainly selfstudy and the exam.

Contact hours
19 hours lectures
15 hours workgroups and presentations

Type of assessment
Lectures and workshops are compulsory and form part of the material that covers the exam. Active participation in discussion is part of the appraisal (presentations of answers to assay questions account for 10% of the exam). Written exam at the end of week 4 include 15 essay questions (90%).

Course reading
The immune system by P. Parham 3th edition, Immunobiology by Janeway 7th edition, Case Studies in Immunology: A Clinical Companion (by Geha 6th edition), including a handout on BB which contains recent reviews specialized on the immunological diseases discussed.

Entry requirements
Bachelor’s course Immunology

Target group
MSc students with a keen interest to study immunological processes within the complexity of diseases such as allergy, multiple sclerosis and AIDS.

Remarks
External lecturers:
Dr. J. Borghans (UMCU)
Prof. dr. F. Koning (LUMC)

Dr. J. Samsom (ErasmusMC)
Dr. W.A. Paxton (AMC)
Prof. dr. T.B.H. Geijtenbeek (AMC)
Prof. dr. B het Hart (UMCG)

Communication, Organization and Management

Course code	AM_470572 ()
Period	Period 2
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	M.J. Kishna
Examinator	M.J. Kishna
Teaching staff	dr. H. Wels, prof. dr. F. Scheele, dr. M.B.M. Zweekhorst
Teaching method(s)	Lecture, Study Group
Level	500

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: approximately 22 hours
Response lectures: 4 hours

Training workshops 12 hours
Self-study and writing project assignment: remaining hours.

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

Complex Trait Genetics

Course code	AM_470733 ()
Period	Period 2
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	prof. dr. D.I. Boomsma
Examinator	prof. dr. D.I. Boomsma
Teaching staff	prof. dr. D.I. Boomsma
Teaching method(s)	Lecture
Level	500

Course objective
Provide the theoretical background into population and biometrical genetics so that students gain an understanding of the way the genome contributes to human variation in behavior, health and disease.

Course content
Quantitative genetics is concerned with the inheritance of those differences between individuals that are of degree rather than of kind (quantitative rather than qualitative). Such differences are seen for most complex human traits (e.g. depression, cognitive abilities or attention problems).
This course aims to provide an understanding of the inheritance of quantitative differences in behavior, psychiatric disorders, endophenotypes (e.g. blood pressure or brain volumes) underlying disease traits (e.g. hypertension or schizophrenia).
Quantitative differences, as far as they are inherited, depend on genes with on average small effects and are usually influenced by gene differences at many loci. Consequently these genes cannot be identified by Mendelian segregation ratios (though they are subject to the laws of Mendelian transmission).
The methods of quantitative genetics differ in from those employed in

Mendelian genetics and have in the past few years undergone a revolution, because we can now assess millions of gene variants and associate those with human traits.
The extension of Mendelian genetics into quantitative genetics will be made in two stages: the genetic properties of populations (population genetics) and the inheritance of measurements (biometrical genetics). Quantitative genetics is now merging with molecular genetics and the last part of this course will be devoted to methods for the localization and characterization of genes causing quantitative variation, focusing on recent developments using genome wide association (GWA) analysis.

Form of tuition
Combined lectures and work groups, twice 4 hours per week.

Type of assessment
Course grades will be based on 3 assignments; for ~40%, 20% and 40% of grades:
1) Read papers (references provided in class) and write a short essay about current issues / state-of-the-art in human genetics (focus on genetic association studies). Select one empricial paper; (try to) read it.
Indicate what is unclear to you. At the end of this course you will asked to review your own essay and then indicate what you now understand better than before.
2) Problems from the book to be assigned after each lecture (about 4 or 5) as home work before the next class. Students will be asked to present the solutions to the problems in class and part of grading depends on how well solutions are presented.
3) Final assignment: oral presentations on a research topic; topics can be chosen from a list of papers or book chapters.

Course reading
Book: Falconer & Mackay: Introduction to Quantitative Genetics (1996) and a series of papers, the final list of papers will change as new papers come out, the list below serves as an indication.

4 papers / commentaries from the New England J of Medicine 23 april, 2009:
J. Hardy and A. Singleton: Current Concepts: Genomewide Association Studies and Human Disease
D. B. Goldstein: Common Genetic Variation and Human Traits
J. N. Hirschhorn: Genomewide Association Studies — Illuminating Biologic Pathways
P. Kraft and D. J. Hunter: Genetic Risk Prediction — Are We There Yet?

Recent review papers
Visscher PM, Brown MA, McCarthy MI, Yang J. Five years of GWAS discovery. Am J Hum Genet. 2012 ;90(1):7-24.
Hirschhorn JN, Gajdos ZK. Genome-wide association studies: results from the first few years and potential implications for clinical medicine. Annu Rev Med. 2011 18;62:11-24.

Recent gene finding papers
*Davies G, et al. Genome-wide association studies establish that human intelligence is highly heritable and polygenic. Mol Psychiatry, 16 (10):996-1005, 2011
* Teslovich TM, et al. Biological, clinical and population relevance of 95 loci for blood lipids. Nature. 466(7307): 707-13, 2010
* Lango Allen H, et al.. Hundreds of variants clustered in genomic loci

and biological pathways affect human height. Nature. 467(7317):832-8, 2010
* Scott RA,. Large-scale association analyses identify new loci influencing glycemic traits and provide insight into the underlying biological pathways. Nat Genet. 44(9):991-1005, 2012

Entry requirements
General knowledge of human and quantitative genetics. When in doubt, ask the course coordinator.

Recommended background knowledge
General knowledge of human and quantitative genetics. When in doubt, contact the course coordinator (Dorret Boomsma: di.boomsma@vu.nl).

Target group
MA Students, PhD-students, postdocs who are interested in the theoratical basis of research on the genetic origin of complex features of man.

Remarks
There will be 2 guest lectures on topics that have emerged after the last edition of the book was published; on fields like epegenetics. Furthermore, it is expected from students that they will join a couple of high-level meetings in the Netherlands, such as from BBRMI-NL.

Containment Strategies of Infectious Diseases in Global Context

Course code	AM_470127 ()
Period	Period 1
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	prof. dr. J.F. van den Bosch
Examinator	dr. D.R. Essink
Teaching staff	dr. D.R. Essink, prof. dr. P.R. Klatser, prof. dr. J.F. van den Bosch
Teaching method(s)	Lecture, Study Group
Level	500

Course objective
The endpoint of this course is that the student
• Has acquired in-depth theoretical and practical knowledge in relation to health intervention strategies for infectious diseases.
• Has acquired insights in various infectious diseases and characteristics in relation to containment strategies.
• Has acquired insight into the role of international institutions, such as the WHO, governmental advisory bodies, relevant professionals, executing institutions, NGOs and communities in designing and carrying out health interventions.
• Understands which barriers are important when implementing containment strategies of infectious diseases, with a focus on vaccination programs.
• Has acquired insight in theoretical concepts and methods to interpret results, evaluations and the effectiveness of programs.
• Has learned and practiced interdisciplinary methods and techniques to

plan health interventions at community level in an interactive way.

Course content
This course covers developments in intervention strategies used to address health needs in a global context. Containment strategies of infectious diseases, in particular vaccination programmes, alert systems and intervention strategies, provide specific areas of attention. The containment strategies to be discussed include programmes for known infections (including vaccination strategies and
in case of absence of a vaccine, diagnosis and treatment strategies) and emerging infections (including isolation, prevention and communication strategies).
The student learns how to analyze bottlenecks and opportunities of the various strategies, how to interpret the results and to evaluate the implementation of programmes.
In addition, the student will take part in a group assignment on how to design containment strategies at community level in an interactive way, for e.g. tuberculosis, polio, rabies, malaria, HIV/AIDS, Ebola, etc. A presentation and writing of an essay will be part of the group assignment.

Form of tuition
Lectures, group assigment, presentation, essay, self-study.
Basic background knowledge will be provided by VU lecturers, whereas relevant guest lecturers will present practical field examples.
Group assignment attendance is compulsory.
Contact hours: lectures 34 hrs, group work 8 hrs.
Self-study approx. 80 hrs.

Type of assessment
Individual exam (60%) and group assignment presentation and essay (40%).
Both parts must at least be sufficient (6 or higher)

Course reading
R. Webber, 2009. Communicable Disease Epidemiology and Control. 3rd Edition. CAB International, UK and USA. ISBN 978-1-84593-504-7.

Slide sets of lectures as made available on BlackBoard

Lecturers may make further readings available on BlackBoard.

Entry requirements
Basic knowledge about the pathogenesis of infectious diseases, microbiology and immunology

Recommended background knowledge
Minor course AB_1046 "Infectious Diseases and Vaccine Development"

Target group
Compulsory course within the Master differentiation International Public Health; optional course for students in other differentiations of the Masters Health Sciences, Biomedical Sciences, and Management, Policy Analysis and Entrepreneurship in Health and Life Sciences. Students from other backgrounds, please contact our secretariat for further information at secretariaat.athena@vu.nl

Registration procedure
Enrollment through BlackBoard.

Remarks
VU lecturers:
Prof. dr. Han van den Bosch
Prof. dr. Paul Klatser
Dr. Dirk Essink
Dr Bernard Ganter

Guest lecturers:
Dr. Jim van Steenbergen (RIVM/LUMC)
Dr. Helma Ruijs (RIVM)
Dr Frank Cobelens (KNCV)
Dr. Constance Schultsz (AIGHD/AMC)
Prof. dr. Maarten Postma (RUG)
Dr. Kitty Maassen (RIVM)
Dr. Koert Ritmeijer (MSF)
Prof. dr. Robert Sauerwein (UMC Nijmegen)
Prof. dr. Cees Hamelink (VU)
Prof. dr. Guus Rimmelzwaan (EMC Rotterdam)
Dr. Hans Zaaijer (Sanguin)
Prof. dr. Christina Vandenbroucke (VUMC)

Developmental Neurobiology of the Vertebrate Brain

Course code	AM_470713 ()
Period	Period 2
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	dr. R.F.G. Toonen
Examinator	dr. R.F.G. Toonen
Teaching staff	dr. R.F.G. Toonen, prof. dr. R.E. Koes
Teaching method(s)	Lecture
Level	500

Course objective
Many brain disorders originate from defects during early brain development. Therefore it is of vital importance that future neuroscience researchers obtain in depth knowledge of brain development.

This course will provide insights in the developmental mechanisms of neural circuits and their plasticity during early and late brain development.
The following issues will be covered: Molecular mechanisms of brain development from neurogenesis, neuronal migration, neuronal differentiation, axonal growth to synapse formation. We will address critical periods of development and experience dependent plasticity during embryonic and adult life in relation to normal brain function and brain disorders.
These topics are discussed while considering the adequate research technology and will be addressed during hands-on lab work using cultured neurons.

Course content

Lectures, seminars, master classes. The first two weeks will consist of lectures covering the developmental neurobiology topics discussed above and master classes from experts in the field of developmental neurobiology. The last two weeks will focus on and hands-on training on early development of mouse neurons in culture. In the last week, students will present on specific topics in developmental neurobiology.

Form of tuition
This is a full time course.
Week 1&2: Lectures and seminars. These 2 weeks will be examined during a mid-term exam.
Week 3&4: Master classes, Journal Clubs and hands-on practicals focussed on
early development of neuronal networks, Human iPS cells and neuro-glia interactions.
In week 4, students will present on specific topics in developmental neurobiology.

Theory (30%)
A. Lectures
- 8 sessions of ± 3 hrs: 24 hrs
B. Masterclasses
- 3 classes of ± 3 hrs: 9 hrs
C. Individual Journal Club task
- 1 high-impact paper presentation 6 sessions of 2 hrs: 12 hrs
Hands-on lab work (30%)
- neuron development in vitro (polarization, neurite outgrowth, synapse formation): 10 sessions of ± 4 hrs: 40 hrs
- Presentation of results lab work: 1 session of 5 hrs
Self study (40%)
- 60 hrs

Type of assessment
Written mid-term exam (40%). Oral presentation of seminar task (30%). Presentation of labwork (30%)
Students need to pass all parts (grade > 5.5) to obtain final grade.

Course reading
Handouts will be distributed at the beginning of the course.
PDFs of all lectures will be made available via BB

Entry requirements
1st year Master of Neurocience or equivalent. Course is also open to non-VU neuroscience students. Please send email to course coordinator with study program details for eligibility check.

Target group
2nd Master of Neuroscience or equivalent

Registration procedure
Maximum number of students is 20.
For further information and application, please contact: Dr. R. Toonen (r.f.g.toonen@vu.nl)

Remarks
Guest lecturers:
Dr. R. Meredith CNCR/FALW
Dr. M. Verheije CNCR/FALW
Dr. V. Heine VUmc

Didactiek 1

Course code	O_MLDIDAC_1 ()
Period	Period 1, Period 4
Credits	6.0
Language of tuition	Dutch
Faculty	Fac. der Gedrags- en Bewegingswetensch.
Coordinator	C.L. Geraedts
Examinator	dr. A. Handelzalts
Teaching staff	drs. J.K.W. Riksen, drs. H.R. Goudsmit, drs. Y.G. Meindersma, ir. E.J.F. Scheringa, drs. W.S. Hoekstra, drs. C.D.P. van Oeveren, drs. S. Donszelmann, drs. B. Klein, drs. W. Jongejan, drs. L.J. van Well-van Grootheest, dr. H.B. Westbroek, C.L. Geraedts, drs. A. Krijgsman, dr. A.A. Kaal, dr. A. Handelzalts, drs. K.L. Schaap, W. Maas, F.L. de Vries MSc, drs. H. Stouthart, drs. I. Pauw
Teaching method(s)	Lecture, Study Group
Level	400

Didactiek 2

Course code	O_MLDIDAC_2 ()
Period	Period 2+3, Period 5+6
Credits	6.0
Language of tuition	Dutch
Faculty	Fac. der Gedrags- en Bewegingswetensch.
Coordinator	drs. B. Klein
Examinator	dr. A. Handelzalts
Teaching staff	drs. J.K.W. Riksen, drs. H.R. Goudsmit, drs. Y.G. Meindersma, ir. E.J.F. Scheringa, drs. W.S. Hoekstra, drs. C.D.P. van Oeveren, drs. S. Donszelmann, drs. B. Klein, drs. W. Jongejan, drs. L.J. van Well-van Grootheest, dr. H.B. Westbroek, C.L. Geraedts, drs. A. Krijgsman, dr. A.A. Kaal, dr. A. Handelzalts, drs. K.L. Schaap, W. Maas, F.L. de Vries MSc, drs. H. Stouthart, drs. I. Pauw
Teaching method(s)	Study Group, Lecture
Level	400

Didactiek 3

Course code	O_MLDIDAC_3 ()
Period	Period 4+5+6
Credits	9.0
Language of tuition	Dutch
Faculty	Fac. der Gedrags- en Bewegingswetensch.
Coordinator	drs. K.L. Schaap
Examinator	drs. K.L. Schaap

Teaching staff	drs. J.K.W. Riksen, drs. H.R. Goudsmit, drs. Y.G. Meindersma, ir. E.J.F. Scheringa, drs. W.S. Hoekstra, drs. C.D.P. van Oeveren, drs. S. Donszelmann, drs. B. Klein, drs. W. Jongejan, drs. L.J. van Well-van Grootheest, dr. H.B. Westbroek, C.L. Geraedts, drs. A. Krijgsman, dr. A.A. Kaal, dr. A. Handelzalts, drs. K.L. Schaap, W. Maas, F.L. de Vries MSc, drs. H. Stouthart, drs. I. Pauw
Teaching method(s)	Lecture, Study Group
Level	400

Disability and Development

Course code	AM_470588 ()
Period	Period 2
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	dr. R.M.H. Peters
Examinator	dr. R.M.H. Peters
Teaching method(s)	Lecture, Study Group
Level	500

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 1 billion 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 of 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-inclusive 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 programme in social and development studies and in international public health. The course will cover essential knowledge and skills in this subject.

The 4-week course programme will include the following subjects:
• Disability models and stereotypes,
• Frequencies and distribution of disability,
• Experience of having a disability,
• ICF conceptual framework,
• Disability rights, including the UN Convention on the Rights of Persons with Disabilities,
• Culture and disability,
• Determinants of disability, including stigma and discrimination, poverty, gender and HIV/AIDS,
• Disability-relevant research methods, including examples of disability research
• An introduction to community-based rehabilitation and disability inclusive development.

Form of tuition
Problem-based learning supported by lectures and an article writing assignment.

• Lectures: 36 hours
• Tutorial groups: 18 hours
• Other events: 12 hours
• Self-study: remaining hours

Type of assessment
Participation in tutorial groups: 10%
Take-home examination, submitted electronically: 60%
Scientific article/essay: 30%

For all parts a pass grade (> 5.5) needs to be obtained in order to receive a final mark.

Course reading
See e-reader

Entry requirements
Bachelor-level education; any subject

Target group

The Disability & Development module is an optional course for Master students Management, Policy Analysis and Entrepreneurship in Health and Life Sciences (MPA), International Public Health and Biomedical Sciences; external students from low and middle-income countries are strongly encouraged to apply. We encourage the participation of students with disabilities, especially from low and middle-income countries.

Remarks
For more information contact Ruth Peters (r.m.h.peters@vu.nl)

Educational and Pedagogical Studies I

Course code	O_MLADEPI ()
Period	Period 1+2
Credits	6.0
Language of tuition	Dutch
Faculty	Fac. der Gedrags- en Bewegingswetensch.
Coordinator	dr. A. Handelzalts
Examinator	dr. A. Handelzalts
Teaching staff	drs. J.K.W. Riksen, drs. H.R. Goudsmit, drs. Y.G. Meindersma, drs. W.S. Hoekstra, drs. C.D.P. van Oeveren, drs. S. Donszelmann, drs. B. Klein, drs. W. Jongejan, dr. H.B. Westbroek, C.L. Geraedts, drs. A. Krijgsman, dr. A.A. Kaal, drs. K.L. Schaap, W. Maas, F.L. de Vries MSc, drs. H. Stouthart, drs. I. Pauw
Teaching method(s)	Lecture
Level	500

Educational and Pedagogical Studies II

Course code	O_MLADEPII ()
Period	Period 1+2
Credits	3.0
Faculty	Fac. der Gedrags- en Bewegingswetensch.
Coordinator	dr. A. Handelzalts
Examinator	dr. A. Handelzalts
Teaching staff	drs. J.K.W. Riksen, drs. H.R. Goudsmit, drs. Y.G. Meindersma, drs. W.S. Hoekstra, drs. C.D.P. van Oeveren, drs. S. Donszelmann, drs. B. Klein, dr. T. Bosma, dr. H.B. Westbroek, C.L. Geraedts, drs. A. Krijgsman, dr. A.A. Kaal, drs. K.L. Schaap, W. Maas, F.L. de Vries MSc, drs. H. Stouthart, drs. I. Pauw
Teaching method(s)	Lecture, Seminar
Level	500

Entrepreneurship in Health and Life Sc.

Course code	AM_470575 ()
Period	Period 2

Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	prof. dr. E. Masurel
Examinator	prof. dr. E. Masurel
Teaching staff	prof. dr. E. Masurel
Teaching method(s)	Lecture, Study Group
Level	500

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.
Learning objectives

- Become familiar with an innovation outlook on entrepreneurship.
- Become aware that value-adding opportunities not only contain financial aspects but also social and ecological aspects (sustainable entrepreneurship).
- Gain the ability to write a feasibility plan on how to bring an innovation to the market.
- Obtain knowledge about and insight in the relevance of entrepreneurship and innovation for science disciplines.
- 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.
- 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.

Schedule and study time
The total study time is 160 hours.
Tuition methods include lectures, consultancies and self-study.
The different elements have the following study time:
- lectures 18 hours
- consultancies 8 hours
- writing feasibility plan 65 hours
- examination 4 hours
- self study remaining hours

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.

Epidemiology

Course code	AM_1179 ()
Period	Period 3
Credits	3.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	dr. R.M.H. Peters
Examinator	dr. R.M.H. Peters
Teaching method(s)	Lecture, Study Group, Computer lab
Level	500

Course objective
• To gain an understanding of the principles of different study designs
• To gain an understanding of issues concerning measures of disease and association
• To gain an understanding of principles of bias and confounding
• To gain an understanding of the principles of screening and critically appraise its use in public health
• To learn how to calculate and interpret sensitivity, specificity, positive and negative predictive values
• To acquire skills to perform statistical analyses using a database (during the computer-based sessions) and interpret, describe and present the results critically

Course content
This two week course will help you to obtain an understanding of the principles of study designs (cross-sectional, longitudinal, case-control, clinical trails). 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 computer-based sessions) and how to interpret the results critically.

Form of tuition
• Lectures (12 hours)
• Work groups (12 hours)
• Computer practicum (12 hours)
• Self-study (remaining time)

Type of assessment
• Exam
• Assignment
Both elements need to be passed.

Course reading
To be announced

Target group
Students without a background in epidemiology

Registration procedure
n/a

Remarks
Maximum 25 students

For more information contact Ruth Peters (r.m.h.peters@vu.nl)

Ethics in Life Sciences

Course code	AM_470707 ()
Period	Period 3
Credits	3.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	prof. dr. J.T. de Cock Buning
Examinator	prof. dr. J.T. de Cock Buning
Teaching staff	prof. dr. J.T. de Cock Buning, dr. J.F.H. Kupper
Teaching method(s)	Lecture, Study Group
Level	400

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 owns life science

specialization and to open it for an impartial and constructive discussion
• To exercise a team based project to enter prepare and execute a moral dialogue
• To acquire the necessary skills to handle ethical issues in an accountable manner, as a professional academic beyond one's own inclinations and prejudgments

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 of technology ethics and medical ethics. The way an ethical review committee on animal research works, is simulated by a role play exercise on an actual research protocol. Finally, as a small group training project, an ethical dialogue is prepared and executed together with another team.

Form of tuition
Ethics in the Life Sciences is a fulltime course of four weeks (3 ECTS). The total study time is 80 hours.
The different elements have the following study time:
• Lectures: 13 hours
• Work groups: 17 hours
• Group assignment: 24 hours
• Exam: 2 hour
• Presentation : 4 hours
• Self working (reading in the first week): 20 hours
Please note that attendance to the work group meetings is compulsory. Attendance to the lectures is highly recommended. In our experience, relying on self-study alone is insufficient to apply the theory of the lectures in the assignments of the workgroups, and to pass the exam.

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

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 and Neuro Sciences

Remarks
Lectures in English, part of the workgroups are in Dutch. All presentations and plenary discussions in English.
In order to maximize the experience of differences in values and preferences, and this increase meaningful ethical inquiry we will place you randomly in the workgroups. Placement will be communicated after the introduction lecture.

Experimental and Clinical Neuroendocrinology

Course code	AM_470700 ()
Period	Period 2
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	dr. C.B. Lambalk
Examinator	dr. C.B. Lambalk
Teaching staff	dr. J.B. Deijen, B.P.C. Kreukels BSc, dr. J. Rotteveel, dr. C.B. Lambalk, dr. M.M. van Weissenbruch, prof. dr. M.A. Blankenstein, prof. dr. M. den Heijer
Teaching method(s)	Lecture, Practical
Level	500

Course objective
The aim of the course is to provide the students not only with a solid basis in the fundamentals of neuroendocrinology, but also with knowledge of recent developments and current research in this field of clinical neurosciences.

Course content
The course includes an understanding of structure and function of the hypothalamo- pituitary axis in relation to growth, stress, reproduction as well as to autonomic- endocrine and immune- endocrine interactions. Diseases of the hypothalamus and pituitary will be discussed, with special emphasis on central regulation of growth, puberty, reproduction, obesity and stress, sexual orientation and gender identity, taking both an experimental and clinical point of view.

Form of tuition
Lectures 24 hrs (appr)
Outpatient clinics 6 hrs
Research tutorials 10 hrs (appr)

Type of assessment
Written examination; open questions.

Course reading
Kandel ER, Schwartz JH, Jessell TM Principles of Neural Science, 2012, 5th edition, McGraw Hill, ISBN 0071390111. (Ch 47) Selected papers to be handed out during the course.

Entry requirements
BSc Biology, BSc Medical Biology, BA Biological Psychology, BA Neuropsychology

Remarks
For further information, please contact mw. M. Evers (M.Evers@vumc.nl)

Maximum nr. of participants 25.

Functional Brain Imaging

Course code	AM_470715 ()
Period	Period 1

Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	dr. P.J.W. Pouwels
Examinator	dr. P.J.W. Pouwels
Teaching method(s)	Computer lab, Lecture
Level	500

Course objective
The student will learn about the most important brain imaging techniques, the principles on which they are based and practical applications in research and patient care. Quite some emphasis on physics and mathematics will be given during the lectures. However, the goal is not to examine the students on this knowledge, but to provide sufficient background to develop a critical and scientific attitude towards imaging techniques. The main focus for the students will be to translate this knowledge into the potential use of techniques in neuroscience.

Course content
In this course the structure and function of the brain will be studied on the mesoscopic and macroscopic level. Three approaches can be distinguished: neurophysiological techniques (EEG, MEG), neuroradiological techniques (MRI, fMRI, MRS) and techniques which involve the use of radio active ligands (SPECT, PET). These techniques will be discussed in relation to ongoing research at the VU University Medical Centre (memory and cognitive dysfunction; white matter diseases, fear and depression; methodological innovation of brain imaging techniques).

Form of tuition
The basic principles and several applications of all techniques will be presented in a series of lectures mainly scheduled during the first 3 weeks (almost full-time, attendance is required). Small groups will discuss particular aspects in more detail. During the course, visits to the departments involved in imaging will be arranged. Hands-on experience of analysis methods is provided in computer practicals.

Type of assessment
Individual written exam (50% of final mark)
Team presentation about a functional brain imaging experiment concerning a neurological disorder / neuroscientific problem. (50% of final mark)

Course reading
- Bullmore E, Sporns O: Complex brain networks: graph theoretical analysis of structural and functional systems. Nat Rev Neurosci. 2009 Mar;10(3):186-98.
- Gong G, He Y, Evans AC: Brain connectivity: gender makes a difference. Neuroscientist. 2011 Oct;17(5):575-91
- Stam CJ: Characterization of anatomical and functional connectivity in the brain: a complex networks perspective. Int J Psychophysiol. 2010 Sep;77(3):186-94.
- Varela F et al: The brainweb: phase synchronization and large-scale integration. Nat Rev Neurosci. 2001 Apr;2(4):229-39.
- Devlin H et al: Introduction to fMRI.
http://www.fmrib.ox.ac.uk/education/fmri/fmri/introduction-to-fmri

- Matthews PM et al: Applications of fMRI in translational medicine and clinical practice. Nat Rev Neurosci. 2006 Sep;7(9):732-44.
- Lazar M: Mapping brain anatomical connectivity using white matter tractography. NMR Biomed. 2010 Aug;23(7):821-35.
- Beaulieu C. The basis of anisotropic water diffusion in the nervous system - a technical review. NMR Biomed. 2002 Nov-Dec;15(7-8):435-55
- Blokland JA et al: Positron emission tomography: a technical introduction for clinicians. Eur J Radiol. 2002 Oct;44(1):70-5.
- Klunk WE et al: Imaging brain amyloid in Alzheimer's disease with Pittsburgh Compound-B. Ann Neurol. 2004 Mar;55(3):306-19.
- Lammertsma AA: Radioligand studies: imaging and quantitative analysis. Eur Neuropsychopharmacol. 2002 Dec;12(6):513-6.
- Phelps ME: Positron emission tomography provides molecular imaging of biological processes. Proc Natl Acad Sci U S A. 2000 Aug 1;97(16):9226-33.
- Baillet S et al: Electromagnetic brain mapping. IEEE Signal Processing Magazine 2001 Nov;18(6):14-30.
- Hari R, Salmelin R: Human cortical oscillations: a neuromagnetic view through the skull. Trends Neurosci. 1997 Jan;20(1):44-9.
- Hillebrand A et al: A new approach to neuroimaging with magnetoencephalography. Hum Brain Mapp. 2005 Jun;25(2):199-211.

Entry requirements
Finished 1st year Master of Neurosciences or finished 1st year Master of Biomedical Sciences.

Target group
Students following 2nd year master-tracks Clinical Neurosciences or Psychophysiology.
Students with other background, please first contact coordinator.

Remarks
There is a maximum number of students.
This means that students other than the target group should first contact coordinator.
Taught in English.
For further information, please contact dr. P.J.W. Pouwels (pjw.pouwels@vumc.nl)

Genomic Data Analysis

Course code	AM_1008 ()
Period	Period 2
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	dr. P. van Nierop
Examinator	dr. P. van Nierop
Teaching staff	dr. P. van Nierop, dr. Z. Bochdanovits
Teaching method(s)	Lecture, Computer lab
Level	500

Course objective
To provide students with basic knowledge and skills to independently design, execute and explain the results of data analysis in the context of a genomics/proteomics experiment.

FINAL ATTAINMENT LEVELS :
(i) Graduated students have acquired the necessary research skills to plan, execute, and reflect on elementary steps in data processing, statistical evaluation, and representation of results of a genomics experiment;
(ii) students have knowledge of the principles behind analysis of protein and DNA sequence information;
(iii) students have basic programming skills in the R programming language

Course content
The course will address various aspects of bioinformatics analysis of the genome and will address the following topics:
- Gene expression analysis: this section of the course deals with stages in data analysis that are associated with large scale transcriptomics data (microarray experiment). Consecutive stages of data analysis, i.e., experimental design (as far as relevant for data analysis), data preprocessing, normalization, statistical evaluation, and the identification of relevant gene groups, are discussed. At each stage specific characteristics of large scale genomics experiments that impair a straightforward interpretation of results are highlighted and alternative analysis strategies are discussed. The lectures are accompanied by computer practicals where theory is put into practice and the basic practical skills are acquired for genomics data analysis and representation in the R programming language. The theoretical and practical skills are applicable to any 'omics' (genomics, proteomics, metabolomics) experiment.
- Analysis of biological sequences: this section of the course teaches the fundamentals of mining of information on DNA and protein sequences relevant for molecular biology research. Special attention is given to the principle of molecular evolution and the translation thereof into algorithms for sequence analysis. Topics of sequence alignment, sequence database searching, and phylogenetic analysis will be discussed, and are accompanied by computer practicals that provide insight into sequence analysis algorithms as well as familiarize students with popular sequence analysis tools such as BLAST and ClustalW.

Form of tuition
Lectures (20 hr), practicals (15 hr)

Type of assessment
Written exam(60%), microarray data analysis assignment (20%), sequence analysis assignment (20%)

Course reading
Dov Stelkel, Microarray bioinformatics, 2003, Cambridge University Press, ISBN 052152587X

David W Mount, Bioinformatics: sequence and genome analysis, 2004, 2nd edition, Cold Spring Harbor Laboratory Press, ISBN 0879697121

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

Target group
The course provides essential body of knowledge and skills to students that pursue a career in Life Sciences at the molecular level (genomics, proteomics, metabolomics).

Remarks
For further information, please contact dr. P. van Nierop (p.van.nierop@vu.nl)

Health Geography

Course code	AM_470094 ()
Period	Period 2
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	dr. ir. J. van Vliet
Examinator	dr. ir. J. van Vliet
Teaching staff	dr. E.H. van der Zanden, dr. ir. J. van Vliet
Teaching method(s)	Lecture, Computer lab
Level	400

Course objective
The overall aim of this course is to provide students with a working knowledge of spatial analysis applications in the context of health science research. Moreover, since spatial analysis can be useful for thesis projects, students are taught to conduct simple spatial analysis tasks independently in a research context

Course content
The course provides an introduction to spatial analysis for health scientists, and discusses examples from several different application domains, such as health access and planning, risk analysis, disease mapping and modelling, and community profiling. At the end of the course, students:
1. Know the application domains of Health Geography and are able to identify them in concrete cases.
2. Have basic knowledge and understanding of GIS, spatial data, and spatial analysis.
3. Are able to analyze a simple health geographic problem independently, design a plan to solve it.
4. Are able to apply a GIS, spatial data, and spatial analysis to solve simple health geographic problems, and report on this by academic standards.
5. Are able to reflect on the methods and result of scientific papers in the field of health geography, as well as on the methods and results of their own spatial analysis.

Form of tuition
20 hours of lectures and guest lectures, 40 hours of computer exercises, 40 hours working on a final assignment (mapping Malaria), and 60 hours of self-study.

Type of assessment
The course is evaluated based on a written exam, that also includes practical ecercises (50%), computer exercises (10%), group discussions of a scientific paper (10%), and the report based on the final assignment (30%)

Course reading
Required reading:
- Wagtendonk and de Jeu (2013) Introduction to geographic information systems and spatial analysis.
- Nykiforuk and Flaman (2011) Geographic Information Systems (GIS) for health promotion and public health: A review

Further background reading will be made available during the course. All literature for this course will be made available through Blackboard.

Entry requirements
Students are expected to have a good knowledge of health sciences, but no prior knowledge of spatial analysis methods.

Target group
Master Students in various health sciences and biomedical science and related fields.

Health, Globalisation and Human Rights

Course code	AM_470818 ()
Period	Period 2
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	A. van Luijn MSc
Examinator	dr. C.W.M. Dedding
Teaching staff	prof. dr. P. Heutink
Teaching method(s)	Lecture, Study Group
Level	500

Course objective
The student;

- Is able to describe, understand and apply human rights concepts in a global context
- Develops a deeper understanding and A critical attitude towards scientific literature in the field of health, globalization and human rights in order to formulate soundly argued positions
- Is able to create his/her own vision with regard to the socio-cultural dimensions of human rights values in relation to public health
- Is able to apply methods of human rights assessment in relation to innovations in health care
- Demonstrates the ability to write and present according to academic standards

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
Contact hours

Lectures: 33 hours
Work groups: 12 hours
Group project, simulation and exam: 11 hours

Self study and preparing: remaining hours

Type of assessment
Group project (10%), Simulation (20%), exam (70%). All parts need to be passed (6.0)

Course reading
To be announced at the start of the first work group/lecture

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
(Guest) Lectures and guest organisations (under reservation):
Cees Hamelink
Christine Dedding (Children and rights)
Fiona Budge (Culture and Health)
Bert Keizer (Elderly Rights)
Els Mons (Rights and disabled persons)
Women on Waves
Doctors without Borders
And more to be announced.

For more information contact Wanda Konijn (w.s.konijn@vu.nl) or Anna van Luijn (a.van.luijn@vu.nl)

Immunity and Disease

Course code	AM_1031 ()
Period	Period 1
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen

Coordinator	dr. I.M.W. van Hoogstraten
Examinator	dr. I.M.W. van Hoogstraten
Teaching staff	dr. I.M.W. van Hoogstraten
Teaching method(s)	Lecture, Study Group
Level	600

Course objective
• To expand knowledge on the whole range of immunological diseases, i.e. immunodeficiency, hypersensitivities, allergies, autoimmunity, (prevention of) infectious disease, graft rejection, graft versus host reactions and tumor immunology, with a focus on immunopathology.
• To train how to study immunological literature on selected immune disorders.
• To introduce critical research questions on immunological aspects of various diseases.
Final attainment levels: The student should be able to
• Explain in depth how and to which extent immune defence mechanisms normally operate, and how they are disturbed in the diseases listed above.
• Point out diagnostic methodologies providing the most relevant information for diagnosis and selection and monitoring of therapeutic interventions.

Course content
Parham's 'The Immune System' (3rd ed.) will be used as a basis for lectures, with a focus on chapter 2,3 and 10-16. First, fundamental concepts in immunity and disease, essential for the built up of the course, will be discussed in the initial lecture. Subsequently, the chapters 2, 3, 10-16 of Parham (3rd ed.) covering diseases listed above, and specific research models are lectured. In addition, small-scale working group sessions are scheduled to provide highly interactive discussions regarding selected recent literature in order to highlight cutting edge research questions (2 x 3 hours).
The course content (literature, lectures on chapters and lectures on research models) will be placed on Blackboard.

Form of tuition
Lectures
Workshops on literature study
Independent study (approx. 120 hrs)

Type of assessment
The course will be closed off with a written exam based on a combination of multiple choice (about literature studies and research models) and open questions (about issues of the book and lectures). This will determine 90% of the final grade; the additional 10% will be determined by the participation in the workshops.
The re-exam takes place annually in January.

Course reading
The immune system, Parham, 3rd edition (ISBN 9780815341468).
Complementary literature on selected topics will be provided on Blackboard.

Entry requirements
Solid knowledge on basic immunology, bachelor degree.

Recommended background knowledge
Parham 3rd ed., chapter 1-9.

Target group
MSc students with a keen interest to study the immunopathology and (potential) therapeutical approaches of a broad range of immunological diseases.

Remarks
Partner coordinator: dr. Juan Garcia Vallejo
Facilitator in coordination: D. Claassen-Kramer
Teaching staff:
prof.dr. W. Bitter; dr. H. Bontkes; dr. S. Cillessen; prof.dr. P. van den Elsen; dr. J. Garcia Vallejo; prof.dr. S. Gibbs; prof.dr. T. de Gruijl; dr. J. den Haan; dr. I. van Hoogstraten; dr. E. Hooijberg; prof.dr. R. Mebius; dr. M. Pegtel; dr. A. van der Sar; prof.dr. C. Verweij.

International Comparative Analyses of Health Care Systems

Course code	AM_470820 ()
Period	Period 3
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	dr. D.R. Essink
Examinator	dr. D.R. Essink
Teaching staff	prof. dr. J.E.W. Broerse, dr. D.R. Essink, dr. T.J. Schuitmaker-Warnaar
Teaching method(s)	Lecture, Study Group
Level	500

Course objective
• To understand and recognize the different components of a health system and different models of health system organization using various frameworks for health system analysis
• To understand and analyze outcomes of health systems with respect to equity, fair financial contribution and health status
• To understand the complex adaptive nature of health systems and its constitution
• To understand different methods in analyzing and comparing health systems: health system performance assessment (benchmarking), case study analysis, cost effectiveness analysis
• To understand the underlying reasons for health system reform and to recognize different health care reform strategies;
• To understand cases study methodology regarding comparison of components of health systems
• To apply the acquired knowledge in the context of;
• To design, carry out and reflect on a (comparative) analysis of developing, transitional and developed countries, making use of the framework for comparative analysis;
• To be able to link the characteristics of policy recommendations, strategies on health system reform and public opinions on certain aspects of care to the specific determinants of the country/region at

hand.
• To give a well structured and academically solid lecture on the comparison of countries;
• To write a clearly structured and academically solid paper on the comparative analysis you have carried out;

Course content
Given the fact that health systems worldwide are confronted with demographical and epidemiological changes, health systems are currently experiencing a period in which they have to re-assess their set-up, framework and goals. In this course you will obtain an overview of the complex nature of health systems and its different components, both with respect to conceptual components (service delivery, resource creation, stewardship, financing) and content components (primary care, mental health care, etc), and you will acquire skills to analyze and compare these components. In various lectures, both the quantitative aspects, and the critique there-upon, and the qualitative aspects of health system comparison is discussed. Furthermore, you will gain insight in the complexity and culturally determined nature of health system design and health system reform, through a series of lectures form VU-lecturers and experts from a variety of institutions such as the Royal Tropical Institute and the Nivel. Through two assignments, you learn and reflect on the topics that are discussed throughout the course. First, you will critically review a comparative analysis report on a specific aspect of health care in Europe, and present this in a lecture. Second, you will set up your own comparative analysis between two selected countries on a specific health care theme. In this case, you are invited to look critically at your own analysis process. You will report on you findings by means of a report and via a poster presentation. In both assignments you will have regular feedback sessions with health researchers in small groups.

Form of tuition
'International Comparative Analyses of Health Care Systems' is a fulltime course of four
weeks (6 ECTS). The total study time is 160 hours. Tuition methods include lectures, training workshops, and self-study.
The different elements have the following study time:
- lectures 22 hours
- assignment sessions 28 hours
- pass/fail test 2 hours
- (project) self study remaining hours

Attendance to the assignment sessions is compulsory

Type of assessment
Your are assessed on the basis of two comparative case study assignments. Both assignments need to be passed (higher then 5.5).
- Assignment 1: 40%
- Assignment 2: 60%
In addition a brief pass/fail test is given which needs a pass but is not graded, to check lecture attendance.

Course reading
A selection of literature will be made on the basis of lectures and state of the art research. (selection of last years literature)

- Mills, A.J. and Ranson, M.K. (2006). The design of health systems. In Merson, M.H., Black, R.E. and Mills, A.J. (eds.).

International public Health: diseases, programs, systems and policies. London: Jones and Bartlett.

Methods: Benchmarking

- WHO (2000). World Health report 2000: health systems: improving performance. Geneva: WHO.
o Message from the director
o Chapters 1 and 2
o Statistical Annex

- M.M. Harbers, E.A. van der Wilk, P.G.N. Kramers, M.M.A.P. Kuunders, M. Verschuuren and Achterberg. (2010) Dare to compare: Benchmarking the Dutch health with the European community health indicators. RIVM
o Chapters 1, 2, 3 and 10

- GP Westert, MJ, van den Berg, SLN Zwakhals, JD de Jong, H Verkleij (2010). The Dutch healthcare performance report. RIVM
o Executive summary
o Chapter 1
o Chapter 6

Methods: case study
- Yin, R. K. (2009). Case Study Research: Design and Methods. Fourth edition, Sage publications, London
o Chapters 1 and 2

Health systems
- George Shakarishvili, Rifat Atun, Peter Berman, William Hsiao, Craig Burgess, and Mary Ann Lansang (2010). Converging Health Systems Frameworks: Towards A Concepts-to-Actions Roadmap for Health Systems Strengthening in Low and Middle Income Countries. In Global Health Governance

- Hsiao (2003). What is a health system and why should we care

- Van Kemenade (2007). European Health Systems. Eslevier
o Chapter 15

- Plsek and Greenlagh, (2001). The challenge of complexity in healthcare. British Medical Journal,10, 323:625

- Building the field of health systems and policy research
o Framing the questions
o An Agenda for Action
o Social Science Matters

- Murray, C.J.L. and Frenk, J. (2008). Health metrics and evaluation: strengthening the science. Lancet, 371(9619), 11911199.

Recommended background knowledge
It is recommended that students have knowledge on public policy in the context of healthcare.

Target group
Compulsory course within the Master specialization International Public Health, optional course within the Master specialization Infectious Diseases (master programme Biomedical Sciences). In any other

circumstances admission should be requested from the course coordinator.

Remarks
Guest lecturers:

dr. Rob Baltussen, health economics at (UMCG)
Dr. Michael van den Berg (RIVM)
Barend Gerretsen (KIT)
Prof. dr. Wienke Boerma (NIVEL)

Internship Biomedical Sciences- no spec.

Course code	AM_471158 ()
Period	Ac. Year (September)
Credits	30.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	dr. R.J. van Belle-van den Berg
Examinator	dr. R.J. van Belle-van den Berg
Level	600

Course objective
The internship is a compulsory part of the Master's programme and involves many different aspects, such as theoretical preparation, practical execution, literature survey, report writing, oral presentation, and participation in the scientific activities of a research department.

The internship should be related to the specialization(s) undertaken.

At the end of the internship a scientific report of the work has to be written as well as an oral presentation given.

For more (detailed) information, please see the placement manual on Blackboard (ALW_BMW_9999_01: Master Programmes Biomedical Sciences and Biology)

Course content
The internship is a compulsory part of the Masters' programme in Biomedical Sciences.
The internship has to be preceded by a research proposal. During the internship, you collect your data and you do the final analysis. Finally you present your findings both orally and in a report.

Internships can be done at various locations, but should be part of an academical or research institute. Projects at academical or research institutes outside the Netherlands are also accepted, provided they are of sufficient academic quality and adequate on-site supervision is guaranteed. In all cases: take care that you will be working on research related to your specialization 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

Research project, under supervision of VU-staff.

Type of assessment
Within six weeks after the start of the internship a Go/No Go evaluation is made by the VU supervisor. The aim of this interim evaluation is to decide whether the project and the student both have enough potential to continue (Go) or not (No Go). This evaluation is based on:
• Written material by the student, including a final research proposal and either the Introduction or Methods section of the article or both.
• Attitude of the student and execution of the project during the initial stage.

The final assessment of the internship is undertaken by the VU-supervisor and the second assessor.
In the final assessment, the VU supervisor assesses four different aspects of the internship:
• the attitude of the student
• the execution of the research
• the final report/article
• the oral presentation
The second assessor provides an assessment of the final report only.

The final report counts for 50% of the final grade, the oral presentation for 25% and the execution of the research also for 25%. Only if marks for each item given by the VU-supervisor and the second assessor are 6 or higher and the attitude is a ‘pass’, the internship is regarded as sufficient. The final grade is calculated from the marks given by both assessors and, together with other administrative details, is summarized in the final assessment form, done by the master's coordinator.

Entry requirements
The student is enrolled in the Master’s programme Biomedical Sciences of which the internship is part and has gained at least 18 ECTS from the programme. Depending on the specialization, additional requirements for admission have to be met (see the Placement Manual).

The second internship can only start after the first internship has been fully completed.

Target group
Students from the MSc Biomedical Sciences

Registration procedure
Every research project has to be approved by the masters’ coordinator in advance (on behalf of the examination board). The Placement Manual describes the process of completing the internship from the beginning (the admission) through the actual execution with its supervision to the final stage (assessment and grading) in consecutive order. The various stages of the process will be supported by forms which are supplied in the appendices or in links. Please see the placement manual on Blackboard (ALW_BMW_9999_01: Master Programmes Biomedical Sciences and Biology).

Remarks
The Placement Manual is based upon the 'Student Placement (Internship) and Research Project Regulations' of the Faculty of Earth and Life Sciences (FALW). Detailed information can be found in the Placement manual Biomedical Sciences on Blackboard (ALW_BMW_9999_01: Master

Programmes Biomedical Sciences and Biology) and in the Academic and Examination Regulations (AER).

Duration of the internship is 5 months (30 EC) and may, under certain circumstances, be elongated to 36 EC (see AER and/or Placement manual).

It is not allowed for your literature thesis and internships to take place on the same or on a highly similar subject.

Internship Educational Specialisation

Course code	AM_471143 ()
Period	Ac. Year (September)
Credits	30.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	dr. R.J. van Belle-van den Berg
Examinator	dr. R.J. van Belle-van den Berg
Level	600

Internship Immunology

Course code	AM_471137 ()
Period	Ac. Year (September)
Credits	30.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	dr. R.J. van Belle-van den Berg
Examinator	dr. R.J. van Belle-van den Berg
Level	600

Course objective
The internship is a compulsory part of the Master's programme and involves many different aspects, such as theoretical preparation, practical execution, literature survey, report writing, oral presentation, and participation in the scientific activities of a research department.

The internship should be related to Immunology.

At the end of the internship a scientific report of the work has to be written as well as an oral presentation given.

For more (detailed) information, please see the placement manual on Blackboard (ALW_BMW_9999_01: Master Programmes Biomedical Sciences and Biology)

Course content
The internship is a compulsory part of the Masters' programme in Biomedical Sciences.
The internship has to be preceded by a research proposal. During the internship, you collect your data and you do the final analysis. Finally

you present your findings both orally and in a report.

Internships can be done at various locations, but should be part of an academical or research institute. Projects at academical or research institutes outside the Netherlands are also accepted, provided they are of sufficient academic quality and adequate on-site supervision is guaranteed. In all cases: take care that you will be working on research related to your specialization 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
Research project, under supervision of VU-staff.

Type of assessment
Within six weeks after the start of the internship a Go/No Go evaluation is made by the VU supervisor. The aim of this interim evaluation is to decide whether the project and the student both have enough potential to continue (Go) or not (No Go). This evaluation is based on:
• Written material by the student, including a final research proposal and either the Introduction or Methods section of the article or both.
• Attitude of the student and execution of the project during the initial stage.

The final assessment of the internship is undertaken by the VU-supervisor and the second assessor.
In the final assessment, the VU supervisor assesses four different aspects of the internship:
• the attitude of the student
• the execution of the research
• the final report/article
• the oral presentation
The second assessor provides an assessment of the final report only.

The final report counts for 50% of the final grade, the oral presentation for 25% and the execution of the research also for 25%. Only if marks for each item given by the VU-supervisor and the second assessor are 6 or higher and the attitude is a ‘pass’, the internship is regarded as sufficient. The final grade is calculated from the marks given by both assessors and, together with other administrative details, is summarized in the final assessment form, done by the master's coordinator.

Entry requirements
The student is enrolled in the Master’s programme Biomedical Sciences of which the internship is part.
The student attended the course:
AM_470656, Advanced Molecular Immunology and Cell Biology
And the student has acquired 18EC of the following courses:
AM_470656, 6EC, Advanced Molecular Immunology and Cell Biology
AM_1031, 6EC, Immunity and Disease
AM_470655, 6EC, Clinical Immunology
AM_470657, 6EC, Molecular Infection Biology

The second internship can only start after the first internship has been fully completed.

Target group

Students from the MSc Biomedical Sciences to specialize in Immunology

Registration procedure
Every research project has to be approved by the masters' coordinator in advance (on behalf of the examination board). The Placement Manual describes the process of completing the internship from the beginning (the admission) through the actual execution with its supervision to the final stage (assessment and grading) in consecutive order. The various stages of the process will be supported by forms which are supplied in the appendices or in links. Please see the placement manual on Blackboard (ALW_BMW_9999_01: Master Programmes Biomedical Sciences and Biology).

Remarks
The Placement Manual is based upon the 'Student Placement (Internship) and Research Project Regulations' of the Faculty of Earth and Life Sciences (FALW). Detailed information can be found in the Placement manual Biomedical Sciences on Blackboard (ALW_BMW_9999_01: Master Programmes Biomedical Sciences and Biology) and in the Academic and Examination Regulations (AER).

Duration of the internship is 5 months (30 EC) and may, under certain circumstances, be elongated to 33 or 36 EC (see AER and/or Placement manual).

It is not allowed for your literature thesis and internships to take place on the same or on a highly similar subject.

Internship Infectious Diseases

Course code	AM_471138 ()
Period	Ac. Year (September)
Credits	30.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	dr. R.J. van Belle-van den Berg
Examinator	dr. R.J. van Belle-van den Berg
Level	600

Course objective
The internship is a compulsory part of the Master's programme and involves many different aspects, such as theoretical preparation, practical execution, literature survey, report writing, oral presentation, and participation in the scientific activities of a research department.

The internship should be related to Infectious Diseases.

At the end of the internship a scientific report of the work has to be written as well as an oral presentation given.

For more (detailed) information, please see the placement manual on Blackboard (ALW_BMW_9999_01: Master Programmes Biomedical Sciences and Biology)

Course content
The internship is a compulsory part of the Masters' programme in Biomedical Sciences.
The internship has to be preceded by a research proposal. During the internship, you collect your data and you do the final analysis. Finally you present your findings both orally and in a report.

Internships can be done at various locations, but should be part of an academical or research institute. Projects at academical or research institutes outside the Netherlands are also accepted, provided they are of sufficient academic quality and adequate on-site supervision is guaranteed. In all cases: take care that you will be working on research related to your specialization 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
Research project, under supervision of VU-staff.

Type of assessment
Within six weeks after the start of the internship a Go/No Go evaluation is made by the VU supervisor. The aim of this interim evaluation is to decide whether the project and the student both have enough potential to continue (Go) or not (No Go). This evaluation is based on:
• Written material by the student, including a final research proposal and either the Introduction or Methods section of the article or both.
• Attitude of the student and execution of the project during the initial stage.

The final assessment of the internship is undertaken by the VU-supervisor and the second assessor.
In the final assessment, the VU supervisor assesses four different aspects of the internship:
• the attitude of the student
• the execution of the research
• the final report/article
• the oral presentation
The second assessor provides an assessment of the final report only.

The final report counts for 50% of the final grade, the oral presentation for 25% and the execution of the research also for 25%. Only if marks for each item given by the VU-supervisor and the second assessor are 6 or higher and the attitude is a 'pass', the internship is regarded as sufficient. The final grade is calculated from the marks given by both assessors and, together with other administrative details, is summarized in the final assessment form, done by the master's coordinator.

Entry requirements
The student is enrolled in the Master's programme Biomedical Sciences of which the internship is part.
The student attended the courses AM_470656, Advanced Molecular Immunology and Cell Biology and AM_470657, Molecular Infection Biology
And the student has acquired 18EC of the following courses:
AM_470656, 6EC, Advanced Molecular Immunology and Cell Biology
AM_470127, 6EC, Containment Strategies of Infectious Diseases in Global Context
AM_470052, 6EC, Parasitology

AM_470094, 6EC, Health Geography
AM_470657, 6EC, Molecular Infection Biology
M_OVIRONC03, 3EC, Viral Oncogenesis
AM_xxxx, 3 EC, Microbial Genomics

Target group
Students from the MSc Biomedical Sciences to specialize in Infectious Diseases

Registration procedure
Every research project has to be approved by the masters' coordinator in advance (on behalf of the examination board). The Placement Manual describes the process of completing the internship from the beginning (the admission) through the actual execution with its supervision to the final stage (assessment and grading) in consecutive order. The various stages of the process will be supported by forms which are supplied in the appendices or in links. Please see the placement manual on Blackboard (ALW_BMW_9999_01: Master Programmes Biomedical Sciences and Biology).

Remarks
The Placement Manual is based upon the 'Student Placement (Internship) and Research Project Regulations' of the Faculty of Earth and Life Sciences (FALW). Detailed information can be found in the Placement manual Biomedical Sciences on Blackboard (ALW_BMW_9999_01: Master Programmes Biomedical Sciences and Biology) and in the Academic and Examination Regulations (AER).

Duration of the internship is 5 months (30 EC) and may, under certain circumstances, be elongated to 33 or 36 EC (see AER and/or Placement manual).

It is not allowed for your literature thesis and internships to take place on the same or on a highly similar subject.

Internship International Public Health

Course code	AM_471139 ()
Period	Ac. Year (September)
Credits	30.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	dr. B.J. Regeer
Examinator	dr. B.J. Regeer
Level	600

Course objective
The internship is a compulsory part of the Master's programme and involves many different aspects, such as theoretical preparation, practical execution, literature survey, report writing, oral presentation, and participation in the scientific activities of a research department.

The internship should be related to International Public Health.

At the end of the internship a scientific report of the work has to be written as well as an oral presentation given.

For more (detailed) information, please see the placement manual on Blackboard (ALW_BMW_9999_01: Master Programmes Biomedical Sciences and Biology)

Course content
The internship is a compulsory part of the Masters' programme in Biomedical Sciences.

The internship has to be preceded by a research proposal. During the internship, you write an extended research design, collect your data and you do the final analysis. Finally you present your findings both orally and in a report.

Internships can be done at various locations, but should be part of an academical or research institute. Projects at academical or research institutes outside the Netherlands are also accepted, provided they are of sufficient academic quality and adequate on-site supervision is guaranteed. In all cases: take care that you will be working on research related to your specialization 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
Research project, under supervision of VU-staff.

Type of assessment
Within six weeks after the start of the internship a Go/No Go evaluation is made by the VU supervisor. The aim of this interim evaluation is to decide whether the project and the student both have enough potential to continue (Go) or not (No Go). This evaluation is based on:
• Written material by the student, including a final research proposal and either the Introduction or Methods section of the article or both.
• Attitude of the student and execution of the project during the initial stage.

The final assessment of the internship is undertaken by the VU-supervisor and the second assessor.
In the final assessment, the VU supervisor assesses four different aspects of the internship:
• the attitude of the student
• the execution of the research
• the final report/article
• the oral presentation
The second assessor provides an assessment of the final report only.

The final report counts for 50% of the final grade, the oral presentation for 25% and the execution of the research also for 25%. Only if marks for each item given by the VU-supervisor and the second assessor are 6 or higher and the attitude is a 'pass', the internship is regarded as sufficient. The final grade is calculated from the marks given by both assessors and, together with other administrative details, is summarized in the final assessment form, done by the master's coordinator.

Entry requirements

The student is enrolled in the Master's programme Biomedical Sciences of which the internship is part.
The student has passed the following courses:
AM_470817, 6EC, Research Methods for Need Assessments
AM_470127, 6EC, Containment Strategies of Infectious Diseases in Global Context
AM_470819, 6EC, Policy, Management and Organization in International Public Health

The second internship can only start after the first internship has been fully completed.

Target group
Students from the MSc Biomedical Sciences to specialize in IPH

Registration procedure
The research proposal is approved by the placement coordinator and the VU-supervisor, after which the application has to be approved by the masters' coordinator in advance (on behalf of the examination board).
The Placement Manual describes the process of completing the internship from the beginning (the admission) through the actual execution with its supervision to the final stage (assessment and grading) in consecutive order. The various stages of the process will be supported by forms which are supplied in the appendices or in links. Please see the placement manual on Blackboard (ALW_BMW_9999_01: Master Programmes Biomedical Sciences and Biology).

Remarks
The Placement Manual is based upon the 'Student Placement (Internship) and Research Project Regulations' of the Faculty of Earth and Life Sciences (FALW). Detailed information can be found in the Placement manual Biomedical Sciences on Blackboard (ALW_BMW_9999_01: Master Programmes Biomedical Sciences and Biology) and in the Academic and Examination Regulations (AER).

Duration of the internship is 5 months (30 EC) and may, under certain circumstances, be elongated to 36 EC (see AER and/or Placement manual).

It is not allowed for your literature thesis and internships to take place on the same or on a highly similar subject.

Internship Med. and Behavioural Genomics

Course code	AM_471142 ()
Period	Ac. Year (September)
Credits	30.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	dr. R.J. van Belle-van den Berg
Examinator	dr. R.J. van Belle-van den Berg
Level	600

Course objective

The internship is a compulsory part of the Master's programme and involves many different aspects, such as theoretical preparation, practical execution, literature survey, report writing, oral presentation, and participation in the scientific activities of a research department.

The internship should be related to Medical and Behavioural Genomics.

At the end of the internship a scientific report of the work has to be written as well as an oral presentation given.

For more (detailed) information, please see the placement manual on Blackboard (ALW_BMW_9999_01: Master Programmes Biomedical Sciences and Biology)

Course content
The internship is a compulsory part of the Masters' programme in Biomedical Sciences.
The internship has to be preceded by a research proposal. During the internship, you collect your data and you do the final analysis. Finally you present your findings both orally and in a report.

Internships can be done at various locations, but should be part of an academical or research institute. Projects at academical or research institutes outside the Netherlands are also accepted, provided they are of sufficient academic quality and adequate on-site supervision is guaranteed. In all cases: take care that you will be working on research related to your specialization 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
Research project, under supervision of VU-staff.

Type of assessment
Within six weeks after the start of the internship a Go/No Go evaluation is made by the VU supervisor. The aim of this interim evaluation is to decide whether the project and the student both have enough potential to continue (Go) or not (No Go). This evaluation is based on:
• Written material by the student, including a final research proposal and either the Introduction or Methods section of the article or both.
• Attitude of the student and execution of the project during the initial stage.

The final assessment of the internship is undertaken by the VU-supervisor and the second assessor.
In the final assessment, the VU supervisor assesses four different aspects of the internship:
• the attitude of the student
• the execution of the research
• the final report/article
• the oral presentation
The second assessor provides an assessment of the final report only.

The final report counts for 50% of the final grade, the oral presentation for 25% and the execution of the research also for 25%. Only if marks for each item given by the VU-supervisor and the second assessor are 6 or higher and the attitude is a 'pass', the internship is regarded as sufficient. The final grade is calculated from the marks

given by both assessors and, together with other administrative details, is summarized in the final assessment form, done by the master's coordinator.

Entry requirements
The student is enrolled in the Master's programme Biomedical Sciences of which the internship is part.
The student has acquired 18EC of the following courses:
AM_470733, 6EC, Complex Trait Genetics
AM_1008, 6EC, Genomic Data Analysis
AM_1040, 6EC, Statistical Genetics for Gene Finding

The second internship can only start after the first internship has been fully completed.

Target group
Students from the MSc Biomedical Sciences to specialize in Medical and Behavioural Genomics.

Registration procedure
Every research project has to be approved by the masters' coordinator in advance (on behalf of the examination board). The Placement Manual describes the process of completing the internship from the beginning (the admission) through the actual execution with its supervision to the final stage (assessment and grading) in consecutive order. The various stages of the process will be supported by forms which are supplied in the appendices or in links. Please see the placement manual on Blackboard (ALW_BMW_9999_01: Master Programmes Biomedical Sciences and Biology).

Remarks
The Placement Manual is based upon the 'Student Placement (Internship) and Research Project Regulations' of the Faculty of Earth and Life Sciences (FALW). Detailed information can be found in the Placement manual Biomedical Sciences on Blackboard (ALW_BMW_9999_01: Master Programmes Biomedical Sciences and Biology) and in the Academic and Examination Regulations (AER).

Duration of the internship is 5 months (30 EC) and may, under certain circumstances, be elongated to 33 or 36 EC (see AER and/or Placement manual).

It is not allowed for your literature thesis and internships to take place on the same or on a highly similar subject.

Internship Neurobiology

Course code	AM_1178 ()
Period	Ac. Year (September)
Credits	30.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Level	600

Course objective

The internship is a compulsory part of the Master's programme and involves many different aspects, such as theoretical preparation, practical execution, literature survey, report writing, oral presentation, and participation in the scientific activities of a research department.

The internship should be related to Neurobiology.

At the end of the internship a scientific report of the work has to be written as well as an oral presentation given.

For more (detailed) information, please see the placement manual on Blackboard (ALW_BMW_9999_01: Master Programmes Biomedical Sciences and Biology)

Course content
The internship is a compulsory part of the Masters' programme in Biomedical Sciences.
The internship has to be preceded by a research proposal. During the internship, you collect your data and you do the final analysis. Finally you present your findings both orally and in a report.

Internships can be done at various locations, but should be part of an academical or research institute. Projects at academical or research institutes outside the Netherlands are also accepted, provided they are of sufficient academic quality and adequate on-site supervision is guaranteed. In all cases: take care that you will be working on research related to your specialization 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
Research project, under supervision of VU-staff.

Type of assessment
Within six weeks after the start of the internship a Go/No Go evaluation is made by the VU supervisor. The aim of this interim evaluation is to decide whether the project and the student both have enough potential to continue (Go) or not (No Go). This evaluation is based on:
• Written material by the student, including a final research proposal and either the Introduction or Methods section of the article or both.
• Attitude of the student and execution of the project during the initial stage.

The final assessment of the internship is undertaken by the VU-supervisor and the second assessor.
In the final assessment, the VU supervisor assesses four different aspects of the internship:
• the attitude of the student
• the execution of the research
• the final report/article
• the oral presentation
The second assessor provides an assessment of the final report only.

The final report counts for 50% of the final grade, the oral presentation for 25% and the execution of the research also for 25%. Only if marks for each item given by the VU-supervisor and the second assessor are 6 or higher and the attitude is a 'pass', the internship is regarded as sufficient. The final grade is calculated from the marks

given by both assessors and, together with other administrative details, is summarized in the final assessment form, done by the master's coordinator.

Entry requirements
The student is enrolled in the Master’s programme Biomedical Sciences of which the internship is part.
The student attended the courses:
AM_470656, Advanced Molecular Immunology and Cell Biology
AM_470712, System Neuroscience
And the student has acquired 18EC of the following courses:
AM_470656, 6EC, Advanced Molecular Immunology and Cell Biology
AM_470726, 6EC, Life Cell Imaging
AM_470728, 6EC, Methods in Behavioral Neurosciences
AM_470713, 6EC, Developmental Neurobiology
AM_1001, 6EC, Neuronal Networks In Vivo
AM_470712, 6EC, System Neuroscience
The second internship can only start after the first internship has been fully completed.
The student is enrolled in the Master’s programme Biomedical Sciences of which the internship is part and has gained at least 18 ECTS from the programme.

The second internship can only start after the first internship has been fully completed.

Target group
Students from the MSc Biomedical Sciences to specialize in Neurobiology

Registration procedure
Every research project has to be approved by the masters’ coordinator in advance (on behalf of the examination board). The Placement Manual describes the process of completing the internship from the beginning (the admission) through the actual execution with its supervision to the final stage (assessment and grading) in consecutive order. The various stages of the process will be supported by forms which are supplied in the appendices or in links. Please see the placement manual on Blackboard (ALW_BMW_9999_01: Master Programmes Biomedical Sciences and Biology).

Remarks
The Placement Manual is based upon the 'Student Placement (Internship) and Research Project Regulations' of the Faculty of Earth and Life Sciences (FALW). Detailed information can be found in the Placement manual Biology on Blackboard (ALW_BMW_9999_01: Master Programmes Biomedical Sciences and Biology) and in the Academic and Examination Regulations (AER).

Duration of the internship is 5 months (30 EC) and may, under certain circumstances, be elongated to 33 or 36 EC (see AER and/or Placement manual).

It is not allowed for your literature thesis and internships to take place on the same or on a highly similar subject.

Internship Psychophysiology

Course code	AM_471140 ()

Period	Ac. Year (September)
Credits	30.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	dr. R.J. van Belle-van den Berg
Examinator	dr. R.J. van Belle-van den Berg
Level	600

Course objective
The internship is a compulsory part of the Master's programme and involves many different aspects, such as theoretical preparation, practical execution, literature survey, report writing, oral presentation, and participation in the scientific activities of a research department.

The internship should be related to Psychophysiology.

At the end of the internship a scientific report of the work has to be written as well as an oral presentation given.

For more (detailed) information, please see the placement manual on Blackboard (ALW_BMW_9999_01: Master Programmes Biomedical Sciences and Biology)

Course content
The internship is a compulsory part of the Masters' programme in Biomedical Sciences.
The internship has to be preceded by a research proposal. During the internship, you collect your data and you do the final analysis. Finally you present your findings both orally and in a report.

Internships can be done at various locations, but should be part of an academical or research institute. Projects at academical or research institutes outside the Netherlands are also accepted, provided they are of sufficient academic quality and adequate on-site supervision is guaranteed. In all cases: take care that you will be working on research related to your specialization 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
Research project, under supervision of VU-staff.

Type of assessment
Within six weeks after the start of the internship a Go/No Go evaluation is made by the VU supervisor. The aim of this interim evaluation is to decide whether the project and the student both have enough potential to continue (Go) or not (No Go). This evaluation is based on:
• Written material by the student, including a final research proposal and either the Introduction or Methods section of the article or both.
• Attitude of the student and execution of the project during the initial stage.

The final assessment of the internship is undertaken by the VU-supervisor and the second assessor.
In the final assessment, the VU supervisor assesses four different

aspects of the internship:
• the attitude of the student
• the execution of the research
• the final report/article
• the oral presentation
The second assessor provides an assessment of the final report only.

The final report counts for 50% of the final grade, the oral presentation for 25% and the execution of the research also for 25%. Only if marks for each item given by the VU-supervisor and the second assessor are 6 or higher and the attitude is a ‘pass’, the internship is regarded as sufficient. The final grade is calculated from the marks given by both assessors and, together with other administrative details, is summarized in the final assessment form, done by the master's coordinator.

Entry requirements
The student is enrolled in the Master’s programme Biomedical Sciences of which the internship is part.
The student has acquired 18EC of the following courses:
AM_470715, 6EC, Functional Brain Imaging
AM_470736, 6EC, Psychophysiology
AM_1003, 6EC, Advanced Human Neurophysiology
AM_470700, 6EC, Experimental and clinical neuroendocrinology

The second internship can only start after the first internship has been fully completed.

Target group
Students from the MSc Biomedical Sciences to specialize in Psychophysiology

Registration procedure
Every research project has to be approved by the masters’ coordinator in advance (on behalf of the examination board). The Placement Manual describes the process of completing the internship from the beginning (the admission) through the actual execution with its supervision to the final stage (assessment and grading) in consecutive order. The various stages of the process will be supported by forms which are supplied in the appendices or in links. Please see the placement manual on Blackboard (ALW_BMW_9999_01: Master Programmes Biomedical Sciences and Biology).

Remarks
The Placement Manual is based upon the 'Student Placement (Internship) and Research Project Regulations' of the Faculty of Earth and Life Sciences (FALW). Detailed information can be found in the Placement manual Biomedical Sciences on Blackboard (ALW_BMW_9999_01: Master Programmes Biomedical Sciences and Biology) and in the Academic and Examination Regulations (AER).

Duration of the internship is 5 months (30 EC) and may, under certain circumstances, be elongated to 33 or 36 EC (see AER and/or Placement manual).

It is not allowed for your literature thesis and internships to take place on the same or on a highly similar subject.

Internship Science in Society

Course code	AM_1133 ()
Period	Ac. Year (September)
Credits	30.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	dr. T.J. Schuitmaker-Warnaar
Examinator	dr. T.J. Schuitmaker-Warnaar

Course objective
The aim of the internship as part of the Major Science in Society (societal specialisation) is to apply the competences acquired during the previous courses in a research project in order to ground the knowledge, attitudes and skills of interdisciplinary research. More specifically, the aims of the internships are:
• The student learns to independently conduct scientific research.
• The student is able to independently find scientific information and to evaluate this for the benefit of his or her own research question.
• The student is able to apply scientific methods and knowledge, to answer research questions and to generate evidencebased knowledge.
• The student is able to formulate a research question, to choose, to implement and to evaluate the (appropriate) research method, and to phrase the obtained results in report.
• The student is able to cooperate with researchers of various disciplines.
• The student is able to orally present the research results and to discuss the findings.
• The student obtains a good impression of a potential future field of career.

Course content
The internship is a compulsory part of the one year specialisation as part of the regular master. The duration of the internship is 5 months (30 EC). An internship placement must provide the student with the opportunity to learn how to conduct research under supervision. The onsite supervisor of the internship is linked to an academic or research institution.

Internships can be done at various locations such as the Ministry of Health, Welfare and Sports, the Public Health Inspectorate, the Health Council, medical organizations such as the municipality health service (GGD), consultancies, the (pharmaceutical) industry and several research institutes, such as universities or e.g. the National Institute for Public Health and the Environment (RIVM).

An internship typically has three phases

• In the first phase, you write your research proposal consisting of an introduction, background, theoretical/conceptual framework, research questions and your research methodology.
• In the second phase, you collect your (qualitative and/or quantitative) data.
• In the third phase, you do your final analysis and present your findings both orally and in a report. The presentation seminar is a compulsory part of this third phase.

Form of tuition
The internship is a compulsory part of the one year specialisation as part of the regular master. The duration of the internship is 5 months (30 EC). An internship placement must provide the student with the opportunity to learn how to conduct research under supervision. The onsite supervisor of the internship is linked to an academic or research institution.

Internships can be done at various locations such as the Ministry of Health, Welfare and Sports, the Public Health Inspectorate, the Health Council, medical organizations such as the municipality health service (GGD), consultancies, the (pharmaceutical) industry and several research institutes, such as universities or e.g. the National Institute for Public Health and the Environment (RIVM).

An internship typically has three phases

• In the first phase, you write your research proposal consisting of an introduction, background, theoretical/conceptual framework, research questions and your research methodology.
• In the second phase, you collect your (qualitative and/or quantitative) data.
• In the third phase, you do your final analysis and present your findings both orally and in a report. The presentation seminar is a compulsory part of this third phase.

Type of assessment
Report (55%), Oral presentation (15%), Execution (30%) and Attitude (Pass/fail)

Within six weeks after the start of the master internship, an interim evaluation will take place to assess whether there is a reasonable chance of the placement being brought to a successful completion.

The internship is supervised and assessed by two lecturers. Both lecturers are members of the academic staff at VU University Amsterdam. The onsite supervision can be carried out by a trainee research assistant (AIO), postdoc or researcher.

Entry requirements
To ensure that students do have enough background knowledge, it is required that you have passed the three compulsory courses: ‘Qualitative and Qualitative Research Methods’, ‘Communication Organization and Management’, and ‘Analysis of Governmental Policy’ (grade at least 6).

Target group
Students Major Science in Society

Registration procedure
Internships can only start when the draft research proposal and application and agreement form is approved and signed by the specialization coordinator.

Remarks
The placement may be extended by 6 EC, subject to conditions that can be found in the FALW document "Student placement (internship) and literature regulations". The student must send a request for extension to the Examination Board.

Information on internships is made available on Blackboard.

Literature thesis Biomedical Sciences

Course code	AM_471135 ()
Period	Ac. Year (September)
Credits	9.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	dr. R.J. van Belle-van den Berg
Examinator	dr. R.J. van Belle-van den Berg

Course objective
The 9 EC literature thesis is a compulsory part of the master Biomedical Sciences, with the aim to reflect on scientific literature. In a total of 6 weeks (full time), the student specializes in a certain topic by gathering and analyzing (recent) scientific articles and other literature that can be included in the literature research. The student can decide the topic of the thesis.

The topic of the thesis needs to match one of the student's research specialization(s).

Form of tuition
Literature thesis, under supervision of VU-staff.

Type of assessment
The assessment of the literature thesis is undertaken by the VU-supervisor and an optional second supervisor.
The literature thesis is assessed on the following aspects:
• execution of the thesis
• final report/review
• oral presentation

Entry requirements
We advice you to have finished at least all the specific courses, and preferrably also the internship, of the research specialization of which this thesis is part.

Target group
Students from the MSc Biomedical Sciences

Registration procedure
Every literature thesis has to be approved by the masters' coordinator in advance (on behalf of the examination board). On Blackboard you can find guidelines for the literature thesis that describe the process of completing the literature thesis from the beginning (the admission) through the actual execution with its supervision to the final stage (assessment and grading) in consecutive order. The various stages of the process will be supported by forms which can also be found on Blackboard. Please see the guidelines on Blackboard (ALW_BMW_9999_01: Master Programmes Biomedical Sciences and Biology).

Remarks

Detailed information can be found in the guidelines on Blackboard (ALW_BMW_9999_01: Master Programmes Biomedical Sciences and Biology) and in the Academic and Examination Regulations (AER).

It is not allowed for your literature thesis and internships to take place on the same or on a highly similar subject.

Live Cell Imaging

Course code	AM_470726 ()
Period	Period 1
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	dr. R.F.G. Toonen
Examinator	dr. R.F.G. Toonen
Teaching staff	dr. R.M. Meredith
Teaching method(s)	Lecture
Level	500

Course objective
This course will provide the student with theoretical and practical knowledge to utilize emerging cellular and sub-cellular imaging technologies in neuroscience.

Course content
Advances in light microscopy, digital image processing, and the development of a variety of powerful fluorescent probes present expanding opportunities for investigating the nervous system, from synaptic terminals to networks in the brain. This intensive theoretical and practical course will provide participants in-depth knowledge to utilize emerging imaging technologies. The primary emphasis of the course will be on vital light microscopy. Students will learn the principles of light microscopy, as well as use of different types of electronic cameras, laser scanning systems, functional fluorophores, delivery techniques, and digital image-processing software. The course will examine a variety of molecular probes of cell function, including calcium-sensitive dyes, voltage-sensitive dyes, photo-activated ("caged") compounds, and exocytosis tracers for synaptic vesicle and neuropetide containing vesicles.
Issues arising in the combination of imaging with electrophysiological methods will be covered. Particular weight will be given to single- and multi-photon laser scanning microscopy, photo-stimulation techniques and to newly available biological fluorophores to monitor vesicle release and transport, especially Green-Fluorescent Protein (GFP) and its variants.

Form of tuition
This is a full time course.
In the first two weeks of the course we will address all major live cell imaging techniques and their applications in a series of lectures and Masterclass meetings with experts in the field. The last 2 weeks will be devoted to hands-on experiments in the lab in small groups.

Theory: (20%)

A. Lectures: 10 x 2 hrs: 20h
B. Journal clubs/lab tour: 10h
Hands-on lab work (45%)
A. Practicals & data analysis: 8 x 7h: 56h
B. Presentations/data assessment/exam: 15h + 2h exam
Self-study (35%)
- 58h
Total: 160h

Type of assessment
Oral presentations (2x) of lab experiments (50%) and Mid-term Exam (50%)
Students need to pass both parts (grade > 5.5) to obtain final grade.

Course reading
Course co-ordinators will provide:
• Selected chapters from Live Cell Imaging. A laboratory Manual.
Editors: Goldman and Spector.
• Selection of primary scientific papers

Entry requirements
1st year Master of Neurocience or equivalent.
Course is also open to non-VU neuroscience students.
Please send email to course coordinators with study program details for eligibility check.

Target group
2nd year Master Neuroscience students of equivalent.

Registration procedure
Maximum number of students is 20. Master of Neuroscience students will have priority. Vacant positions will be filled on basis of first come first serve. For further information and application, please contact:

Dr. R. Toonen (r.f.g.toonen@vu.nl) or Dr. R. Meredith (r.m.meredith@vu.nl).

Remarks
Guest lectuerers:
Dr. C. Lohman NIN, KNAW
Dr. P Mangeol FEW
Drs B. v. Oort FEW
Drs. A. Negrean CNCR, FALW

Methods in Behavioral Neurosciences

Course code	AM_470728 ()
Period	Period 1
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	dr. R.O. Stiedl
Examinator	dr. R.O. Stiedl
Level	500

Course objective
The course will give an overview of methods, the behavior tests and its measures, used in a number of different research areas in behavioural neuroscience and the interpretation of these data. It will provide a critical overview on behavioral phenotyping aspects of mice and rats used in biomedical research as models for human disorders/disease. The course aims to develop critical thinking about interpretations of animal behavior.

The course will include a practical in week 2 to generate data that will be converted into a joint manuscript by all course participants by splitting up the different tasks. The course will also expose to the evaluation procedure of manuscripts as an important part of the review process for publication of scientific data.

Course content
In behavioral neuroscience we study how different brain areas are involved in the control and execution of behavior. Importantly, the methods used have to capture important aspects of the normal behavior of the animal. In order to obtain results that are both reproducible and reliable it is important to that the methods used are standardized and that there is agreement on what the measures actually mean (its interpretation).

Questions that we will address are:
1) How can we record animal behavior in a reproducible fashion?
2) Which test assays and behavioral parameters are important and which brain areas are involved?
3) How do we analyze the data that we have obtained?
4) Can the results be interpreted unambiguously?
5) What are the pros and cons of currently used behavior assays?

The following topics will be covered to better understand and judge the behavior test spectrum and its use in behavioral phenotyping:

- Standardization of behavior tests
- Classical and novel tests and measures of anxiety and fear
- Telemetry and optogenetics in behavioral neuroscience
- Autonomic functions in behavior as index of emotion
- Home cage-based phenotyping of mice
- Spatial learning tests in rodents: clues and pitfalls
- Neural aspects of spatial orientation

The overall course focus will be on emotional and cognitive aspects of behavior.

Form of tuition
Lectures, partly with demonstrations, and discussion based on primary research papers. Individual and group work for the preparation os a manuscript.

Type of assessment
1) Student presentation related to the course topics (20%)
2) Written chapters for the jointly prepared manuscript (40%)
3) Written examination with open-ended questions (40%)
In all three assessment forms the minimal grade has to be 5.5 to pass the course.

Course reading
Primary literature (papers) generally provided through digital blackboard.

Entry requirements
Basic knowledge of animal behavior.

Target group
MSc. Biology and MSc. Neuroscience students

Microbial Genomics

Course code	AM_1021 ()
Period	Period 3
Credits	3.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	prof. dr. R. Kort
Examinator	prof. dr. R. Kort
Teaching method(s)	Lecture
Level	500

Course objective
1. After the lecture series the students obtained insight in:

- The historical development of microbiological sciences
- Techniques to explore the human microbiome
- Human – Microbe interactions in Health and Disease
- Metabolic strategies of microorganisms
- Interventions with probiotics, prebiotics and synbiotics

2. Students have gained experience on thinking and writing about the impact of microbes on either our environment, human health, or industrial applications.

Course content
During 10 lectures, the enormous diversity of microbial life will become evident. The lectures will include a number of ways to explore microbial life forms associated with our body, in particular related to health and disease. Applications of our knowledge on the human microbiota for diagnostics, prognostics and interventions will be discussed.

10 lectures (obligatory) including a 4-5 p. perspective

Form of tuition
10 lectures (obligatory) including a 4-5 p. perspective

Type of assessment
Each student will write a perspective (approximately 4-5 pages) for of one of the 10 lectures; the abstract will containing a 1 page summary of the lecture, and 3 pages on the relevance of the microbiological topic for society (with particular emphasis on human heath). The selected lecture will be announced after the final lecture.

Course reading
Selected papers:

Kort R, Caspers M, van de Graaf A, van Egmond W, Keijser B, Roeselers G. Shaping the oral microbiota through intimate kissing. Microbiome. 2014 Nov
17;2:41.

Budding AE, Grasman ME, Lin F, Bogaards JA, Soeltan-Kaersenhout DJ, Vandenbroucke-Grauls CM, van Bodegraven AA, Savelkoul PH. IS-pro: high-throughput
molecular fingerprinting of the intestinal microbiota. FASEB J. 2010 Nov;24(11):4556-64

Borgdorff H, Tsivtsivadze E, Verhelst R, Marzorati M, Jurriaans S, Ndayisaba
GF, Schuren FH, van de Wijgert JH. Lactobacillus-dominated cervicovaginal
microbiota associated with reduced HIV/STI prevalence and genital HIV viral load
in African women. ISME J. 2014 Sep;8(9):1781-93.

Dutilh BE. Metagenomic ventures into outer sequence space. Bacteriophage. 2014
Dec 15;4(4):e979664.

Belzer C, Gerber GK, Roeselers G, Delaney M, DuBois A, Liu Q, Belavusava V,
Yeliseyev V, Houseman A, Onderdonk A, Cavanaugh C, Bry L. Dynamics of the
microbiota in response to host infection. PLoS One. 2014 Jul 11;9(7):e95534.

Entry requirements
Molecular Biology

Recommended background knowledge
General and Molecular Microbiology

Target group
MSc Students BioMolecular Sciences

Remarks
Venue: Artis de Volharding

http://www.artis.nl/ontdek-artis/artis-a-z/monumenten-z/de-volharding/

Announcement of lecture series:

http://www.micropia.nl/nl/ontdek/verdiep-je-in-de-microbiologie/the-huma

Lecture topics and speakers:

Microbiome in Health and Disease
Monday Jan 4 (10.00 – 12.00 u)
Prof. Remco Kort (TNO, VUA). Introduction into the human microbiome.
https://www.linkedin.com/pub/remco-kort/14/547/403
Dries Budding, MD (VUMC). Man and Microbe: a delicate superorganism

https://www.linkedin.com/pub/dries-budding/5/956/78
Tuesday Jan 5 (10.00 u – 12.00 u)
Dr. Douwe Molenaar (VUA). Dealing with big data of the microbiota.
http://www.ibi.vu.nl/sysbio/doku.php/people/douwe_molenaar
Dr. Evgeni Levin-Tsivtsivadze (TNO). Microbial ecology in health and disease: a machine learning approach.
http://www.learning-machines.com/
Friday Jan 8 (10.00 u – 12.00 u)
Dr. Bas Dutilh (UU). Metagenomic ventures into outer sequence space.
https://www.linkedin.com/in/dutilh
Dr. Guus Roeselers (TNO). Microbial ecology of the gastro-intestinal tract.
https://www.linkedin.com/in/roeselers
Monday Jan 11 (10.00 – 12.00)
Prof. Eddy Smid (WUR). The best foods are made by microbes.
https://www.linkedin.com/pub/eddy-j-smid/9/338/9a8
Prof Wilbert Bitter (VUMC) Die hard with a vengeance, strategy of mycobacterial pathogens.
http://www.aimms.vu.nl/en/people/b/bitter.aspx
Tuesday Jan 12 (10.00 – 12.00)
Prof. Janneke van de Wijgert (University of Liverpool, Institute of Infection and Global Health). Microbial ecology of bacterial vaginosis.
https://www.linkedin.com/pub/janneke-van-de-wijgert/7/195/2a0
Prof. Gregor Reid (Canadian Centre for Human Microbiome and Probiotic Research, Lawson Health Research Institute). Fermented milk as a delivery vehicle for probiotics in Africa.

Molecular Infection Biology

Course code	AM_470657 ()
Period	Period 2
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	prof. dr. W. Bitter
Examinator	prof. dr. W. Bitter
Teaching staff	prof. dr. W. Bitter
Teaching method(s)	Lecture, Practical
Level	600

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.

contact hours:
lectures: 18
Literature Workshop: 17
Practicum: 30-40

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 will be available one week before the start of the course.

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
Guest lectures:
Dr. Peter van der Ley, RIVM Bilthoven, molecular techniques used for vaccine development
Dr. Lia van der Hoek, AMC Amsterdam, identification of novel viral pathogens

Neuronal Networks in Vivo

Course code	AM_1001 ()
Period	Period 2
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen

Coordinator	dr. C.P.J. de Kock
Examinator	dr. C.P.J. de Kock
Teaching staff	dr. C.P.J. de Kock
Teaching method(s)	Study Group, Practical
Level	600

Course objective
The aim of this exciting course is to provide insight into the most intricate
neuronal network of the brain – the cortical microcircuit. 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 methods-thesis and a mini-thesis. In the methods thesis (individual ppt) you will highlight a recently developed (in vivo) technique and discuss the advantages and disadvantages. In the mini-thesis (duo-setting, pdf and ppt) you will review two experimental papers (from a pre-selected or self-chosen set) and write a critical evaluation. 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, mouse and human brain slices.

Form of tuition
Lectures 16 hours 31% 1.9 ECTS
Demo’s in vivo experiments 16 hours 31% 1.9 ECTS
Histology workshop 8 hours 15% 0.9 ECTS
Cell identific. workshop 2 hours 4% 0.2 ECTS
Final presentations 10 hours 19% 1.1 ECTS

Total 52 hours 100% 6.0 ECTS

Type of assessment
1) Written exam

2) Presentation on an in vivo methods.

3) Written thesis (5 pages) on an in vivo topic, accompanied by a presentation. The topic can fall into three catagories: 1) a "hot" current topic in the field. 2) the topic covers a set of papers with conflicting outcomes or 3) the topic covers similar outcomes with different in vivo approaches.

Final grading depends on Exam (25%), Methods presentation (25%), Written topic thesis (25%), and Topic presentation (25%). All components have to be passed.

Course reading
Oberlaender et al, Cereb Ctx 2012
Narayanan et al, Cereb Ctx 2015
Markram et al, Nat.Neurosci 2006
Hill et al, PNAS 2012

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

Remarks
Guest Lecturers:
Hemanth Mohan, MSc, FALW
Roel de Haan, MSc, FALW
Anton Pieneman, FALW
Keerthi Kumar, MSc FALW
Antonio Luchicci, Dr. FALW

Parasitology

Course code	AM_1055 ()
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	dr. M. Campos Ponce
Examinator	dr. M. Campos Ponce
Teaching staff	dr. M. Campos Ponce, dr. C.B. Polman, dr. M.R. van Dijk
Teaching method(s)	Lecture, Practical, Study Group, Computer lab
Level	400

Parasitology

Course code	AM_470052 ()
Period	Period 2
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	dr. M.R. van Dijk
Examinator	dr. M.R. van Dijk
Teaching staff	dr. M. Campos Ponce, dr. C.B. Polman, dr. M.R. van Dijk
Teaching method(s)	Lecture, Computer lab, Practical, Study Group
Level	400

Course objective
This course aims to provide students with a wide knowledge and understanding of Medical Parasitology.

At the end of the course students: will have learned the principles of medical parasitology and will be able to:

*apply these principles to different parasite groups
*describe parasite life cycles
*identify the role of the host and parasite on the outcome of an infection and describe underlying molecular host-parasite interactions
*describe (and understand) the effect of parasite infection on other infectious diseases as well as on non-communicable diseases
*describe the advantages and disadvantages of diagnostic techniques as discussed in literature.
*describe the principles for treatment and prevention programmes
*describe the principles for vaccination research
*debate on important controversies within parasitological themes

Course content
The course will cover all aspects of medical important parasites: life cycles, virulence factors, (immunological) interaction between parasites and their host(s), diagnosis, epidemiology, control and elimination.

Form of tuition
Lectures will be followed by discussion groups or in- class assignments. In discussion groups students will be expected to demonstrate an in-depth understanding of medically important parasites.

During the first two weeks students will have (interactive) guest lectures covering all aspects of medical parasitology. During these first two weeks they will also have to present selected articles during two sessions and they will have the opportunity to observe and identify parasites during the parasite demonstration.
The examination will take place in the third week.
In the final week students will present a grant application on a selected parasite during an elevator
pitch. At the end of this week students will have to prepare and actively participate in a debate on a selected parasitological topic.

Total contact hours:
Lectures: 32 hours
Workgroups:14 hours
Parasite demonstration: 4 hours

Type of assessment
The final grade will be determined on the basis of an written exam. Bonus points can be earned on the basis of oral presentations (regular presentations as well as their performance during the elevator pitch and the debate).

Course reading
Reader

Entry requirements
Immunology, Infectious disease

Recommended background knowledge
Basic cell biology and basic immunology

Target group
Obligatory course within the MSc Infectious disease specialisation Health Sciences; Optional course within the MSc programmes of Biomedical sciences.

Remarks
Several guest lecturers will be invited to give lectures

Peergroup 1

Course code	O_MLPEERGR_1 ()
Period	Period 1+2+3, Period 4+5+6
Credits	0.0
Language of tuition	Dutch
Faculty	Fac. der Gedrags- en Bewegingswetensch.
Coordinator	dr. A. Handelzalts
Examinator	dr. A. Handelzalts
Teaching method(s)	Study Group
Level	400

Peergroup 2

Course code	O_MLPEERGR_2 ()
Period	Period 3+4+5
Credits	0.0
Language of tuition	Dutch
Faculty	Fac. der Gedrags- en Bewegingswetensch.
Coordinator	dr. A. Handelzalts
Examinator	dr. A. Handelzalts
Teaching method(s)	Study Group

Policy, Management and Organisation in International Public Health

Course code	AM_470819 ()
Period	Period 2
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	prof. dr. J.E.W. Broerse
Examinator	prof. dr. J.E.W. Broerse
Teaching staff	prof. dr. J.E.W. Broerse, M.O. Kok
Teaching method(s)	Lecture, Study Group
Level	500

Course objective
To develop a detailed understanding of the health policy process and its outcomes both at national and international level
To acquire insight into the different theoretical concepts on policy design in the field of public health
To understand how policy decisions are translated into programs and projects, and subsequently implemented

To get acquainted with different management practices in health programs
To gain insight into change management
To get acquainted with and acquire skills in international diplomacy, resolution writing, negotiation and the procedures of the United Nations

Course content
This course contains two parts that will run parallel throughout the course: a theoretical part and a practical, diplomacy, part. In the theoretical part you study different theoretical concepts of policy science in international public health. You study core concepts of public administration in relation to IPH such as power relations, securing public interest, public versus private sector, managing change and the network society. Questions are addressed such as: In what way does the political structure of a country influence health policies; Why do certain topics get on the policy agenda while other topics never make it; Why do policy makers and politicians regularly seem to ignore scientific insights; To what extent do international organisations (such as the World Bank and the World Health Organisation) influence national policies? In the diplomacy part you develop basic diplomatic skills by practicing them in 4 training sessions and a final 1.5 day World Health Organization simulation under Model United Nations rules of procedure (WHO MUN). Model United Nations (informally abbreviated as Model UN or MUN) is an academic simulation of the United Nations that aims to educate you about civics, effective communication, globalization and multilateral diplomacy. In Model UN, you take on roles as foreign diplomats and participate in a simulated session of the WHO.

Form of tuition
Lectures (29 hours), training workshops (14 hours) and simulation (12 hours), self study (102,5 hours), and examination (2.5 hours)

Type of assessment
Individual exam (70%) and diplomacy assignment (30%). Both grades need to be at least 5.5 to pass the course.

Course reading
"Making Health Policy", Kent Buse,Nicholas Mays & Gill Walt, 2005, Open University Press, ISBN 0-335-21839-3

"The Wisdom of Whores", Elizabeth Pisani, 2008, Granta Publications, ISBN978-1-84708-076-9

Other reading materials via Blackboard

Target group
Compulsory course within the Master specialization International Public Health; optional course for students in other specializations of the Masters Health Sciences and Biomedical Sciences.

Remarks
Attendance of training workshops and simulation is compulsory.
For further information and application, please contact Anna van Luijn (a.van.luijn@vu.nl)

Policy, Politics and Participation

Course code	AM_470589 ()

Period	Period 2
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	dr. R.M. Edelenbosch MSc
Examinator	dr. R.M. Edelenbosch MSc
Teaching staff	dr. B.J. Regeer, dr. J.F.H. Kupper, prof. dr. J.E.W. Broerse
Teaching method(s)	Lecture, Study Group
Level	500

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 be trained in and practice various skills for data collection (such as focus group design and facilitation) and data analysis (such as qualitative content analysis).
Specific attention is paid to your personal interactive research skills. At the end of the course, you prepare a policy report to present your findings. In an oral presentation your team will highlight the main results of your analysis and defend the recommendations you propose.

Form of tuition
Lectures: 14 hours
Training workshops: 4 hours
Project assignment: 102 hours
focus group execution: 6 hours
Final presentations project results: 4 hours
Self study: remaining hours

Type of assessment
The course does not have an oral or written exam. You will be assessed on the basis of the group assignment, a group presentation and on your individual performance during the course (in the work groups, your facilitation skills in the ‘real’ focus groups). For all parts a pass grade (> 5.5) needs to be obtained in order to receive a final mark.

Your final mark will be based on: the group report (40%): oral

presentation per group(40%): individual performance (20%).

Course reading
To be announced on Blackboard

Entry requirements
Basic knowledge of (interactive) policy processes, policy analysis and relevant research skills are required.

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.

Registration procedure
Registration deadline by VUnet is 4 weeks before the start of the course.

Remarks
As the project depends on team work, attendance is compulsory.

Praktijk 1

Course code	O_MLPRAK_1 ()
Period	Period 1, Period 4
Credits	6.0
Language of tuition	Dutch
Faculty	Fac. der Gedrags- en Bewegingswetensch.
Coordinator	dr. A. Handelzalts
Examinator	dr. A. Handelzalts
Teaching staff	drs. J.K.W. Riksen, drs. H.R. Goudsmit, drs. Y.G. Meindersma, ir. E.J.F. Scheringa, drs. W.S. Hoekstra, drs. C.D.P. van Oeveren, drs. S. Donszelmann, drs. L.J. van Well-van Grootheest, dr. H.B. Westbroek, C.L. Geraedts, drs. A. Krijgsman, dr. A.A. Kaal, dr. A. Handelzalts, drs. K.L. Schaap, W. Maas, F.L. de Vries MSc, drs. H. Stouthart, drs. I. Pauw
Teaching method(s)	Study Group
Level	400

Praktijk 2

Course code	O_MLPRAK_2 ()
Period	Period 2+3, Period 5+6
Credits	9.0
Language of tuition	Dutch
Faculty	Fac. der Gedrags- en Bewegingswetensch.
Coordinator	dr. A. Handelzalts
Examinator	dr. A. Handelzalts

Teaching staff	drs. J.K.W. Riksen, drs. H.R. Goudsmit, drs. Y.G. Meindersma, ir. E.J.F. Scheringa, drs. W.S. Hoekstra, drs. C.D.P. van Oeveren, drs. S. Donszelmann, dr. H.B. Westbroek, C.L. Geraedts, drs. A. Krijgsman, dr. A.A. Kaal, dr. A. Handelzalts, drs. K.L. Schaap, W. Maas, F.L. de Vries MSc, drs. H. Stouthart, drs. I. Pauw
Teaching method(s)	Study Group
Level	400

Praktijk 3

Course code	O_MLPRAK_3 ()
Period	Period 4+5+6
Credits	15.0
Language of tuition	Dutch
Faculty	Fac. der Gedrags- en Bewegingswetensch.
Coordinator	dr. A. Handelzalts
Examinator	dr. A. Handelzalts
Teaching staff	drs. J.K.W. Riksen, drs. H.R. Goudsmit, drs. Y.G. Meindersma, ir. E.J.F. Scheringa, drs. W.S. Hoekstra, drs. C.D.P. van Oeveren, drs. S. Donszelmann, dr. H.B. Westbroek, C.L. Geraedts, drs. A. Krijgsman, dr. A.A. Kaal, dr. A. Handelzalts, drs. K.L. Schaap, W. Maas, F.L. de Vries MSc, drs. H. Stouthart, drs. I. Pauw
Level	400

Praktijk onderzoek 1

Course code	O_MLPROZ_1 ()
Period	Period 3, Period 6
Credits	3.0
Language of tuition	Dutch
Faculty	Fac. der Gedrags- en Bewegingswetensch.
Coordinator	dr. H.B. Westbroek
Examinator	dr. H.B. Westbroek
Teaching staff	drs. J.K.W. Riksen, drs. H.R. Goudsmit, drs. Y.G. Meindersma, ir. E.J.F. Scheringa, dr. M. Meeter, drs. W.S. Hoekstra, drs. C.D.P. van Oeveren, drs. S. Donszelmann, drs. B. Klein, drs. W. Jongejan, drs. L.J. van Well-van Grootheest, dr. T. Bosma, dr. H.B. Westbroek, C.L. Geraedts, drs. A. Krijgsman, dr. J.M.H. Swennen, dr. A.A. Kaal, dr. A. Handelzalts, drs. K.L. Schaap, W. Maas, F.L. de Vries MSc, drs. H. Stouthart, drs. I. Pauw
Teaching method(s)	Study Group, Lecture
Level	400

Praktijk onderzoek 2

Course code	O_MLPROZ_2 ()
Period	Period 4+5+6
Credits	6.0
Language of tuition	Dutch
Faculty	Fac. der Gedrags- en Bewegingswetensch.
Coordinator	dr. H.B. Westbroek
Examinator	dr. A. Handelzalts
Teaching staff	drs. J.K.W. Riksen, drs. H.R. Goudsmit, drs. Y.G. Meindersma, ir. E.J.F. Scheringa, dr. M. Meeter, drs. W.S. Hoekstra, drs. C.D.P. van Oeveren, drs. S. Donszelmann, drs. B. Klein, drs. W. Jongejan, drs. L.J. van Well-van Grootheest, dr. T. Bosma, dr. H.B. Westbroek, C.L. Geraedts, dr. J.M.H. Swennen, dr. A.A. Kaal, dr. A. Handelzalts, drs. K.L. Schaap, W. Maas, F.L. de Vries MSc, drs. H. Stouthart, drs. I. Pauw
Teaching method(s)	Lecture, Seminar
Level	400

Psychophysiology

Course code	AM_470736 ()
Period	Period 1
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	prof. dr. J.C.N. de Geus
Examinator	prof. dr. J.C.N. de Geus
Teaching staff	prof. dr. J.C.N. de Geus
Teaching method(s)	Study Group, Practical, Lecture
Level	400

Course objective
1) Insight in the link between emotional state and peripheral nervous system activity and the most recent experimental approaches and research designs in the field of autonomic and cardiovascular psychophysiology.

2) Practical skills in the measurement of autonomic nervous system and cardiovascular stress-reactivity.

Course content
In plenary lectures we will outline the organisation of the autonomic nervous system and the cardiovascular system and how their activity is reflected in peripheral physiological signals. The lectures are interspersed with a series of practicals, where the students apply a broad arsenal of instruments and techniques (ElectroCardioGram, ImpedanceCardioGram, Skin-conductance, Respiration, Finger Blood Pressure, Hormones) to record these signals and to extract parameters that can be used to index psychological processes (e.g. mental load, emotion and stress). This will be done in a standardized laboratory setting using the Biopac system as well as in naturalistic open-field settings using the Vrije Universiteit Ambulatory Monitoring System (VU-

AMS). Amongst others, students will measure (on each other): skin-conductance responses to emotion, cardiorespiratory coupling, baroreflex regulation, and sympathetic and parasympathetic reactivity to mental and physical stress. The main principles and strategies for data analysis will be covered in the lectures and applied in the practicals to the self-recorded data-sets.

Form of tuition
In plenary lectures we will outline the organisation of the autonomic nervous system and the cardiovascular system and how their activity is reflected in peripheral physiological signals. The lectures are interspersed with a series of practicals, where the students apply a broad arsenal of instruments and techniques (ElectroCardioGram, ImpedanceCardioGram, Skin-conductance, Respiration, Finger Blood Pressure, Accelerometry) to record these signals and to extract parameters that can be used to index psychological processes (e.g. mental load, emotion and stress). This will be done in a standardized laboratory setting using the Biopac system as well as in naturalistic open-field settings using the Vrije Universiteit Ambulatory Monitoring System (VU-AMS). Amongst others, students will measure (on each other): skin-conductance responses to emotion, cardiorespiratory coupling, baroreflex regulation, and sympathetic and parasympathetic reactivity to mental and physical stress. The main principles and strategies for data analysis will be covered in the lectures and applied in the practicals to the self-recorded data-sets.

Number of contact hours:
Lectures: 20h
practicals & practical preparation: 70h
Examination: 2h
self-study: 70h

Type of assessment
Written examination (50% of grade) and independent performance of a short experiment (20%) and analysis and presentation of the data collected (30%).

Course reading
1) Psychophysiology reader with selected open access papers (published on BlackBoard, end of August)

AND

2a) Vander, A., Sherman, J. & Luciano, D. Human physiology, the mechanisms of body function. Boston: WCB-McGraw-Hill: blz 373-463 (Circulation), blz 463-504(Respiration).
OR
2b) Stanfield J, Principles of Human Physiology (4th Ed). Pearson Education Inc: chapters 13,14 (Circulation), and 16 (Respiration)

AND

3) 7 short practical manuals

Entry requirements
If followed as part of the Master Biomedical Sciences must have completed the 1st year.

Recommended background knowledge
General knowledge of cardiovascular physiology, SPSS usage, and biomedical experimentation.

Target group
Master of Biomedical Sciences, Master of Neuroscience or comparable Master programs.

Remarks
Due to the large amount of practicals, it is essential to know timely how many students will enroll. Students are advised to email the course coordinator (j.c.n.de.geus@vu.nl) that they aim to enroll, and to do so well before August 1.

Qualitative and Quantitative Research Methods

Course code	AM_470582 ()
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	dr. J.F.H. Kupper
Examinator	dr. J.F.H. Kupper
Teaching staff	dr. H. Wels, dr. B.J. Regeer, dr. J.F.H. Kupper
Teaching method(s)	Lecture, Study Group, Computer lab
Level	400

Course objective
- Understanding the differences between beta- and gamma research;
- To acquire insight and understanding of a real world research process. This includes knowledge of the character of complex societal issues and the needs, advantages and disadvantages of real world research;
- 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 be able to make an adequate research design for the investigation of a specific complex societal 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 an 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 real world research: questionnaires, systematic observations using all the senses, surveys and statistics, semi-structured in-depth interviews, as well as focus groups. These methods are commonly used in 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, you 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 research design.

Form of tuition
Lecture (20h), Training workshops (34h), Research project (107h), Examination (3h).

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

Course reading
Verschuren, D.E. and Doorewaard, H. (2010). Designing a Research Project (2nd edition)Eleven International Publishing, the Hague. ISBN 978-90-5931-572-3.

Gray, D.E. (2014) Doing Research in the Real World (3rd edition)Sage Publications Ltd, Los Angeles. ISBN 978-1-4462-6019-7

Target group
Compulsory course in the Master programme Management, Policy Analysis and Entrepreneurship for the Health and Life Sciences (MPA) and compulsory course within the Science communication- and Societal differentiations of Health, Life and Natural Sciences Masters programmes.

Remarks
Attendance of training workshops is compulsory. For further information please contact Marlous Arentshorst: m.e.arentshorst@vu.nl

Reflective Practice Internship Science Communication

Course code	AM_1163 ()
Period	Ac. Year (September)
Credits	30.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	dr. J.F.H. Kupper
Level	600

Course objective
The internship is a compulsory part of the Master's programme. The aims of the internship are:
• Learn to independently apply and expand your practical science communication skills in one particular area of the field (writing, multi-media, facilitation, policy and strategy development, content design, etc.).
• Critical self-assessment and reflection on acquired science communication competencies in the field.
• Conduct scientific research independently: assess scientific information, design a research project, apply scientific methods, collect data, report and discuss findings.

• Present and discuss about internship and research outcomes.
• Learn to cooperate with researchers and practitioners of various disciplines.
• Gain an impression of a potential future field of career.

Course content
When you are enrolled in the VU Science Communication specialization or the UvA Major Science Communication you need to conduct one internship (30 ECTS, 5 months). One of the two possible formats is the Reflective Practice Internship (RPI). The complete and up-to-date information about the internship can be found in the SC internship guide line on blackboard (science communication community).

Form of tuition
Work-based placement

Type of assessment
Written report and oral presentation.
Within six weeks after the start of the master internship, an interim evaluation will take place to assess whether there is a reasonable chance of the placement being brought to a successful completion.
The internship is supervised and assessed by two lecturers. Both lecturers are members of the academic staff at VU University Amsterdam. The day-to-day supervision can be carried out by a trainee research assistant (AIO), postdoc or researcher.

Target group
Students MSc Earth science year 2

Remarks
Participation in this compulsory component is only permitted if the student meets the relevant requirements for admission. These requirements are detailed in the Internship guidelines of Earth science (on
Blackboard) and in the Academic and Examination Regulations.
The work-based placement is subject to the FALW document: “Student placement (internship) and literature regulations”. These regulations require detailed written agreements between supervisors and student that specify the conditions for the Master research project. This agreement should be sent for approval by the science communication co-ordinator at least two weeks before the planned start of the work-based placement. If the proposal is of sufficient quality, you can start your internship. If not, you’ll need to adapt your proposal and send it for approval again. You can only start your internship after your research design has been approved.
The placement may be extended by 6 EC, subject to conditions that can be found in the FALW document “Student placement (internship) and literature regulations”. The student must send a request for extension to the Earth science Examination Board.
Information on Master internships is made available on Blackboard.

Research I

Course code	O_MLVPOOI ()
Period	Period 1+2+3
Credits	3.0
Language of tuition	Dutch

Faculty	Fac. der Gedrags- en Bewegingswetensch.
Coordinator	dr. A. Handelzalts
Examinator	dr. A. Handelzalts
Teaching staff	drs. J.K.W. Riksen, drs. H.R. Goudsmit, drs. Y.G. Meindersma, drs. I. Pauw, drs. W.S. Hoekstra, drs. C.D.P. van Oeveren, drs. S. Donszelmann, drs. W. Jongejan, dr. H.B. Westbroek, C.L. Geraedts, drs. A. Krijgsman, prof. dr. J.J. Beishuizen, dr. A.A. Kaal, drs. K.L. Schaap, W. Maas, F.L. de Vries MSc, drs. H. Stouthart
Teaching method(s)	Lecture, Seminar
Level	500

Research II

Course code	O_MLVPOOII ()
Period	Period 1+2+3
Credits	6.0
Faculty	Fac. der Gedrags- en Bewegingswetensch.
Coordinator	dr. H.B. Westbroek
Examinator	dr. H.B. Westbroek
Teaching staff	drs. W. Jongejan, dr. T. Bosma, dr. H.B. Westbroek, dr. A.A. Kaal, dr. A. Handelzalts, W. Maas
Teaching method(s)	Lecture, Seminar
Level	500

Research Internship Science Communication

Course code	AM_1162 ()
Period	Ac. Year (September)
Credits	30.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	dr. J.F.H. Kupper
Level	600

Course objective
The internship is a compulsory part of the Master's programme. The aims of the internship are:
• Learn to independently apply and expand your practical science communication skills in one particular area of the field (writing, multi-media, facilitation, policy and strategy development, content design, etc.).
• Critical self-assessment and reflection on acquired science communication competencies in the field.
• Conduct scientific research independently: assess scientific information, design a research project, apply scientific methods, collect data, report and discuss findings.
• Present and discuss about internship and research outcomes.
• Learn to cooperate with researchers and practitioners of various

disciplines.
• Gain an impression of a potential future field of career.

Course content
When you are enrolled in the VU Science Communication specialization or the UvA Major Science Communication you need to conduct one internship (30 ECTS, 5 months). One of the two possible formats is the full Research Internship. The complete and up-to-date information about the internship can be found in the SC internship guide line on blackboard (science communication community).

Form of tuition
Work-baed placement

Type of assessment
Written report and oral presentation.
Within six weeks after the start of the master internship, an interim evaluation will take place to assess whether there is a reasonable chance of the placement being brought to a successful completion.
The internship is supervised and assessed by two lecturers. Both lecturers are members of the academic staff at VU University Amsterdam. The day-to-day supervision can be carried out by a trainee research assistant (AIO), postdoc or researcher.

Target group
Students Earth science year 2

Remarks
Participation in this compulsory component is only permitted if the student meets the relevant requirements for admission. These requirements are detailed in the Internship guideline of science communication (on
Blackboard) and in the Academic and Examination Regulations.
The work-based placement is subject to the FALW document: “Student placement (internship) and literature regulations”. These regulations require detailed written agreements between supervisors and student that specify the conditions for the Master research project. This agreement should be sent for approval by the science communication internship or master co-ordinator
at least two weeks before the planned start of the work-based placement.
If the proposal is of sufficient quality, you can start your internship.
If not, you’ll need to adapt your proposal and send it for approval again. You can only start your internship after your research design has been approved.
The placement may be extended by 6 EC, subject to conditions that can be found in the FALW document “Student placement (internship) and literature regulations”. The student must send a request for extension to the earth science Examination Board.
Information on Master internships is made available on Blackboard.

Research methods for analyzing complex problems

Course code	AM_1182 ()
Period	Period 1
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen

Coordinator	dr. M.E. Arentshorst MSc
Examinator	dr. M.E. Arentshorst MSc
Teaching method(s)	Lecture, Seminar, Computer lab
Level	400

Course objective
The objectives of this course are:

- To understand the differences between beta- and gamma research;
- To acquire insight in and understanding of a real world research process, including knowledge of the character of complex societal issues and the needs, advantages and disadvantages of real world research;
- To acquire insight into various quantitative and qualitative research methods, their underlying theoretical concepts and their relative strengths and weaknesses;
- Being able to apply these various quantitative and qualitative research methods in a specific societal context;
- To interpret quantitative and qualitative findings;
- Being able to create an adequate research design for the investigation of a specific complex societal problem.

Course content
Contemporary societies increasingly face complex social problems, such as climate change, HIV/ AIDS or ethnic and religious diversity. These complex problems involve a variety of social actors: policy-makers, professionals, NGOs, industries, science and, of course, the public at large. Addressing these complex issues demands an 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 real world research, including questionnaires, systematic observations, surveys and statistics, semi-structured interviews, and focus groups. These methods are commonly used in 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.

Form of tuition
Research Methods for Analyzing Complex Problems is a fulltime course of four weeks (6 ECTS). The total study time is 160 hours. Tuition methods include lectures, workgroups, workshops, group project work and self-study.

The different elements have the following study time:
- lectures 20 hours
- workgroups and training 36 hours
- examination 3 hours
- project work & reading (self-study) Remaining hours

Please note that attendance to the workgroup sessions is compulsory. If you miss one workgroup, with a good reason, you will receive an additional assignment. If you miss more than one workgroup session it is no longer possible to pass the project part of the course.

Attendance to the lectures is highly recommended. In our experience, relying on self-study alone is insufficient to apply the theory of the lectures in the assignments of the workgroups, and to pass the exam.

Type of assessment
The course grade is based on the group assignment 'study design' and the exam. Both aspects need to be graded 6.0 or higher.

Exam 50% of total grade
Group assignment 'study Design' 50% of total grade

Course reading
The literature of this course consists of selected scientific articles that are provided on blackboard, and the books:
- Verschuren, D.E. and Doorewaard, H. (2010). Designing a Research Project
(2nd edition)Eleven International Publishing, the Hague. ISBN 978-90-5931-572-3.
- Gray, D.E. (2014) Doing Research in the Real World (3rd edition)Sage Publications Ltd, United Kingdom. ISBN 978-1-4462-6019-7

An overview of the literature per lecture will be provided on blackboard.

Target group
The course ‘Research Methods for Analyzing Complex Problems’ is a compulsory course for first year master students ‘Management, Policy Analysis and Entrepreneurship in Health and Life Sciences’. This course is also a compulsory course within the Science communication- and Societal differentiations of Health, Life and Natural Sciences Master programmes. It is an optional course for other Life Sciences Master program students at the VU University.

Registration procedure
VUnet

Remarks
Lectures are in English, part of the workgroups are in Dutch. The assignments are written in English.

Please note that attendance to the workgroup sessions is compulsory. If you miss one workgroup, with a good reason, you will receive an additional assignment. If you miss more than one workgroup session it is no longer possible to pass the project part of the course.

Attendance to the lectures is highly recommended. In our experience, relying on self-study alone is insufficient to apply the theory of the lectures in the assignments of the workgroups, and to pass the exam.

course coordinator: Marlous Arentshorst - m.e.arentshorst@vu.nl

Research Methods for Need Assessments

Course code	AM_470817 ()
Period	Period 1
Credits	6.0
Language of tuition	English

Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	dr. D.R. Essink
Examinator	dr. D.R. Essink
Teaching staff	dr. M.B.M. Zweekhorst, dr. B.J. Regeer, dr. J.F.H. Kupper, dr. D.R. Essink, E.F. Maassen MSc
Teaching method(s)	Lecture, Study Group, Computer lab
Level	400

Course objective

• The overall goal is to acquire insights, skills and attitudes regarding various quantitative and qualitative research methods used for conducting needs assessment, analysis of international public health problems, epidemiological investigation, field surveys to strengthen public health surveillances and understand the relative strengths and weaknesses of the various research methods
• To be able to make an adequate research design for the analysis of a specific health problem (theory, concepts and design)
• To acquire knowledge and skills in interview techniques, questionnaire design, and focus groups (data collection)
• To acquire insight in ways to involve community members and patients to include their views and jointly decide on the needs and priorities. This includes interactive and participatory methods for transdisciplinary research, such as focus groups, diagramming, mapping and other visualisation techniques (participative data collection)
• To know how to interpret quantitative and qualitative findings in the context of international public health (data analysis)

Course content

This course focuses on the knowledge, skills and attitude needed to design and conduct research in the field of international public health, with a specific focus on needs assessments. Before planning a health intervention, a thorough epidemiological, behavioural and social analysis of quality of life, health problems, health related behaviours, their causes and contributing factors should be conducted. The social context, environmental factors and community capacity should be investigated. To achieve results, it is necessary for health workers to (1) work with other sectors in a so called inter-sectoral approach, and (2) work with the community, since communities have relevant knowledge which increases the quality of the interventions and ownership of the implementation process. In other words, a transdisciplinary approach is required.
A variety of qualitative and quantitative methods can be employed. During this course the most essential research methods will be addressed and practiced: questionnaires, surveys and epidemiological statistics, semi-structured in-depth interviews, as well as several interactive and participatory methods, such as focus group discussions, diagramming, mapping and other visualisation techniques. Strengths and weaknesses of each research method and technique will be discussed, as well as the possibility to apply them in resource-poor settings and in different communities.
Throughout the course, students will apply the acquired theoretical knowledge by conducting and presenting their own mini-study in small groups.

Form of tuition
'Research methods for needs assessments' is a fulltime course of four weeks (6 ECTS). The total study time is 160 hours. Tuition methods include lectures, training workshops, and self-study.

The different elements have the following study time:
- lectures 18.5 hours
- workshops and training 31.5 hours
- (project) self study 107 hours
- examination 3 hours
Attendance to the workshops and training is compulsory

Type of assessment
The course grade is based on the study design and the exam. Both aspects have to be concluded with the grade of 5.5 or higher.
Exam : 50% of total grade
Study-Design: 50% of total grade

Course reading
Verschuren, P. and Doorewaards, H. (2010) Designing a research project (2nd edition) Eleven International Publishing, The Hague.

Gray, D.E. (2014) Doing Research in the Real World (3rd edition)Sage Publications Ltd, Los Angeles.

Entry requirements
Knowledge of epidemiology and SPSS is a prerequisite to gain access to this course.
For further information please contact b.j.regeer@vu.nl.

Target group
Compulsory course within the Master specialization International Public Health of the Master programmes Health Sciences and Biomedical Sciences. Optional course within the Master specialization Infectious Diseases (master programme Biomedical Sciences). In any other circumstances admission should be requested from the course coordinator.

Science and Communication

Course code	AM_470587 ()
Period	Period 1
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	P. Klaassen MA
Examinator	P. Klaassen MA
Teaching staff	dr. B.J. Regeer, dr. J.F.H. Kupper, drs. ir. M.G. van der Meij, P. Klaassen MA
Teaching method(s)	Lecture, Study Group
Level	500

Course objective
- Gain theoretical insight in the relationship between science and society,
- Gain insight in the role of science communication in this

relationship,
- Acquire knowledge of different theories and models of science communication,
- Acquire knowledge of different strategies, media and activities for science communication,
- Learn how to apply theoretical concepts to real-life examples,
- Development of practical skills for science communication (e.g. writing, discussing).

Course content
Science is all around us and shapes our lives in many different ways. From the vaccines you need for travelling abroad, to the technological devices you use on a daily basis. At the same time, society shapes the development of science and technology. Science and society influence each other continuously; they communicate. Students of Science Communication are expected to become experts in understanding and designing interaction between science and society. In order for this interaction to be fruitful and valuable for both science and society, it is important to gain in-depth knowledge about the theoretical basis of the field of science communication and understand communication processes at the core of several interfaces; e.g. the communication between scientists from different disciplines, between different sciences and their stakeholders, and between science and the public. This course provides a broad basis in the field of science communication by addressing the main areas of science communication and by discussing and challenging several core concepts within this field. Students are invited to explore some issues in greater depth and active participation in lectures and workgroups is required.

Form of tuition
Lectures (22 h)
Workgroups (18 h)
Home-study for group assignments (8 h)
Home-study for individual assignments/exam (90h)

Type of assessment
Individual assignments (30%), group assignment (10%), examination (60%). For all parts a pass grade needs to be obtained.

Course reading
Academic articles. Direct links to articles will be provided on BlackBoard one month before the beginning of the course.

Target group
The course Science and Communication is a compulsory course for students of the Master specialisation Science Communication (Wetenschapscommunicatie) and is a prerequisite for the internship. Science and Communication is an optional course for students from other master programs in the health and life sciences.

Science in Dialogue

Course code	AM_1002 ()
Period	Period 2
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen

Coordinator	dr. J.F.H. Kupper
Examinator	dr. J.F.H. Kupper
Teaching staff	dr. J.F.H. Kupper
Teaching method(s)	Study Group, Lecture, Seminar
Level	500

Course objective
To gain knowledge of and insight into:
- the basic concepts and issues in the understanding of science-society interactions, both from a science and technology studies 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 reflective learning and mutual understanding

To acquire or improve:
- individual skills for effective interpersonal communication
- individual 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 self-evaluated by means of a refle ction report.
Every course week is completed with a mini-exam.

Form of tuition
Lectures (14h), Workgroups (28h), Training workshops (24h), Dialogue presentations (12h), Selfstudy
(remaining hours)

Type of assessment
Group assignment (50%), Take home exam (30%), Reflection report (20%).
All assignments must be passed (grade > 6).

Course reading
Is announced on blackboard one month before start of the course

Target group
Optional course in the MSc specialization Science Communication

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

Science Journalism

Course code	AM_471014 ()
Period	Period 2
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	dr. J.F.H. Kupper
Examinator	dr. J.F.H. Kupper
Teaching staff	dr. J.F.H. Kupper
Teaching method(s)	Lecture, Study Group, Computer lab
Level	500

Course objective
To acquire knowledge of and insight into:
- the concepts, models and issues of science journalism according to contemporary scientific literature
- the criteria for effective science journalism with respect to diverse media
- the representation of science in the media
- the role of science journalism in the use of scientific knowledge in society

To acquire skills in:
- writing popular scientific texts for different genres such as news, background and interview
- science reporting using videos
- designing science communication for different media such as newspaper, radio and internet

Orientation to the professional practice of science journalism

Course content
This course teaches the basic principles of science journalism. A series of interactive lectures reviews both the practical as well as the theoretical aspects of science journalism. Topics that are discussed are the translation of science to a language that is both compelling and understandable, the role of journalism in the interaction between science and society, images of science in the media and the ethics of science journalism. The interactive lectures invite you to take your own defendable position with regard to these issues.

Guest lectures provide insight into the professional practice of science journalists. The guest speakers work as freelancer, editor or producer at diverse science media, such as newspapers (NRC, Volkskrant), magazines (NWT), internet (Noorderlicht) and radio (Labyrint). Finally, the course trains specific skills that you need as a science journalist, such as popular writing, popular science videos, interviewing, conceptual analysis
and program design.

Form of tuition
Lectures and seminars on theory and practice of science journalism and writing skill training (36h). Considerable time is set aside for performing science journalism in assignments (108h). The assignments are assessed by lecturers and fellow students (peer-review process). Self study (remaining hours).

Type of assessment
Several individual assignments (60%), several small group assignments (40%). All assignments must be passed (grade > 6).

Course reading
Announced on Blackboard one month before start of the course

Target group
All Master students with a Beta-Bachelor degree. Students taking this course as part of their C-specialisation 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 coördinator (Frank Kupper) before enrolment.

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

Science Museology

Course code	AM_470590 ()
Period	Period 3
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	dr. B.J. Regeer
Examinator	dr. B.J. Regeer
Teaching staff	dr. B.J. Regeer, drs. ir. M.G. van der Meij
Teaching method(s)	Lecture, Study Group, Seminar, Fieldwork
Level	500

Course objective
- Gain insight in the role of museum exhibits in the field of science communication.
- Gain insight in the role of science communication concepts in the context of science museums.
- Apply qualitative research methods to design, conduct, and report on a user research project in museum settings.
- Apply theoretical notions of science communication and exhibit design to advise development of exhibit experience and content design.

- Gain experience in working for an external commissioner.

Course content
This course is about the role of science museums/centers, zoos and natural history museums in science communication. You will get familiar with theories of science communication in museum settings, and will be introduced to different styles of communication, different approaches to exhibit design & development, and different methods of research and evaluation of exhibitions.
Guest speakers and lecturers give insight into their profession (1) as science communicators in museums and science centers, (2) as researchers in the field of museology, and/or (3) as professionals in informal science & technology learning environments.
Through individual and group assignments you are encouraged to combine theory and practice, working step-by-step towards (part of) an exhibition (re-)design. The group assignments are commissioned by museums and science centers, such as NEMO, Museon, Naturalis, Delft Science Centre, and Artis.

Form of tuition
Lectures
Workgroups
Workshops
Home-study for group assignments
Home-study for individual assignments
Field work

Type of assessment
Group assignment (50%), presentation (poster and oral) (10%), and individual exam(s) (40%). For the assignments, presentations and all exams a pass-grade must be obtained.

Course reading
Academic articles. Direct links to articles will be provided on Blackboard one month before the beginning of the course.

Entry requirements
It is possible to follow the course as an elective course outside of one of the science communication master specialisations of FALW/FEW. In that case additional reading may be required depending on the student's background.

Target group
Optional course in the Science Communication master specialisation of most of the two-year master programs of the FALW and FEW faculties. Master students from other universities in any scientific field are welcome as well. Additional reading may be required.

Remarks
Guest lectures from and excursions to for instance Artis, NEMO, Naturalis, NorthernLight, Museon, etc.

Scientific Writing in Engl (AM_BIO&BMED)

Course code	AM_1161A ()
Period	Period 2
Credits	3.0

Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	M. van den Hoorn
Examinator	M. van den Hoorn
Teaching method(s)	Study Group
Level	400

Course objective
The aim of this course is to provide Master's students with the essential linguistic know-how for writing a scientific article in English that is well organized idiomatically and stylistically appropriate and grammatically correct.
At the end of the course students
- know how to structure a scientific article;
- know what the information elements are in parts of their scientific article;
- know how to produce clear and well-structured texts on complex subjects;
- know how to cite sources effectively;
- know how to write well-structured and coherent paragraphs;
- know how to construct effective sentences;
- know what collocations are and how to use them appropriately;
- know how to adopt the right style (formal style, cohesive style, conciseness, hedging)
- know how to avoid the pitfalls of English grammar;
- know how to use punctuation marks correctly;
- know what their own strengths and weaknesses are in writing;
- know how to give effective peer feedback.

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

Course content
The course will start with a general introduction to scientific writing in English. Taking a top-down approach, we will then analyse the structure of a scientific article in more detail. As we examine each section of an article, we will peel back the layers and discover how paragraphs are structured, what tools are available to ensure coherence within and among paragraphs, how to write effective and grammatically correct sentences and how to choose words carefully and use them effectively.

Topics addressed during the course include the following:
- Structuring a scientific article
- Considering reading strategies: who is your readership? How do they read your text? What do they expect? How does that affect your writing?
- Writing well-structured and coherent paragraphs
- Composing effective sentences (sophisticated word order, information distribution).
- Arguing convincingly – avoiding logical fallacies
- Academic tone and style: hedging – why, how, where?
- Using the passive effectively
- Understanding grammar (tenses, word order, etc.)
- Understanding punctuation

- Referring to sources: summarising, paraphrasing, quoting (how and when?)
- Avoiding plagiarism
- Vocabulary development: using appropriate vocabulary and collocations

Form of tuition
Scientific Writing in English is an eight-week course and consists of 4 contact hours during the first week and 2 contact hours a week for the rest of the course. Students are required to spend at least 6 to 8 hours of homework per week. They will work through a phased series of exercises that conclude with the requirement to write several text parts (Introduction, Methods or Results section, Discussion and Abstract). Feedback on the writing assignments is given by the course teacher and by peers.

Type of assessment
Students will receive the three course credits when they meet the following requirements:
- Students hand in three writing assignments (Introduction, Methods or Results, Discussion) and get a pass mark for all writing assignments;
- Students provide elaborate peer feedback;
- Students attend all sessions;
- Students are well prepared for each session (i.e. do all homework assignments);
- Students actively participate in class;
- Students do not plagiarise or self-plagiarise.

Course reading
Effective Scientific Writing: An Advanced Learner's guide to Better English (A. Bolt & W. Bruins, ISBN 978 90 8659 6171). VU bookstore: €27.95.

Target group
Students Biology and students Biomedical Sciences

Registration procedure
Important: each group has a minimum of 18 and maximum of 24 participants, so students should register on time through VUnet to ensure a place in one of the (designated) groups. If you have registered for a group in VUnet, you are expected to attend all sessions (eight). If you decide to withdraw from the course, please do so in time. This all will avoid a 'fail' on your grade list for not taking part in this course and allows other students to fill in a possible very wanted group spot.

Each semester, one or more open/general groups also take place (with a minimum of 18 participants), for which students may register instead of the designated group for their master programme. Students are advised to consult their schedule carefully, since overlap may occur. For more information, please check course code AM_471023.

Remarks
- To do well, students are expected to attend all lessons. Group schedules are to be found at rooster.vu.nl and on Blackboard.
- If you (expect to) miss a session, please inform the group trainer as soon as possible. If you miss a session without notification, you may not be able to finish the course.
- For any questions concerning this course, please

contact onderwijsbureau.beta@vu.nl.

Scientific Writing in Engl (AM_BMED)

Course code	AM_1161B ()
Period	Period 3+4
Credits	3.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	M. van den Hoorn
Examinator	M. van den Hoorn
Teaching method(s)	Study Group
Level	400

Course objective
The aim of this course is to provide Master's students with the essential linguistic know-how for writing a scientific article in English that is well organized idiomatically and stylistically appropriate and grammatically correct.
At the end of the course students
- know how to structure a scientific article;
- know what the information elements are in parts of their scientific article;
- know how to produce clear and well-structured texts on complex subjects;
- know how to cite sources effectively;
- know how to write well-structured and coherent paragraphs;
- know how to construct effective sentences;
- know what collocations are and how to use them appropriately;
- know how to adopt the right style (formal style, cohesive style, conciseness, hedging)
- know how to avoid the pitfalls of English grammar;
- know how to use punctuation marks correctly;
- know what their own strengths and weaknesses are in writing;
- know how to give effective peer feedback.

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

Course content
The course will start with a general introduction to scientific writing in English. Taking a top-down approach, we will then analyse the structure of a scientific article in more detail. As we examine each section of an article, we will peel back the layers and discover how paragraphs are structured, what tools are available to ensure coherence within and among paragraphs, how to write effective and grammatically correct sentences and how to choose words carefully and use them effectively.

Topics addressed during the course include the following:
- Structuring a scientific article
- Considering reading strategies: who is your readership? How do they read your text? What do they expect? How does that affect your writing?

- Writing well-structured and coherent paragraphs
- Composing effective sentences (sophisticated word order, information distribution).
- Arguing convincingly – avoiding logical fallacies
- Academic tone and style: hedging – why, how, where?
- Using the passive effectively
- Understanding grammar (tenses, word order, etc.)
- Understanding punctuation
- Referring to sources: summarising, paraphrasing, quoting (how and when?)
- Avoiding plagiarism
- Vocabulary development: using appropriate vocabulary and collocations

Form of tuition
Scientific Writing in English is an eight-week course and consists of 4 contact hours during the first week and 2 contact hours a week for the rest of the course. Students are required to spend at least 6 to 8 hours of homework per week. They will work through a phased series of exercises that conclude with the requirement to write several text parts (Introduction, Methods or Results section, Discussion and Abstract). Feedback on the writing assignments is given by the course teacher and by peers.

Type of assessment
Students will receive the three course credits when they meet the following requirements:
- Students hand in three writing assignments (Introduction, Methods or Results, Discussion) and get a pass mark for all writing assignments;
- Students provide elaborate peer feedback;
- Students attend all sessions;
- Students are well prepared for each session (i.e. do all homework assignments);
- Students actively participate in class;
- Students do not plagiarise or self-plagiarise.

Course reading
Effective Scientific Writing: An Advanced Learner's guide to Better English (A. Bolt & W. Bruins, ISBN 978 90 8659 6171). VU bookstore: €27.95.

Target group
Students Biomedical Sciences

Registration procedure
Important: each group has a minimum of 18 and maximum of 24 participants, so students should register on time through VUnet to ensure a place in one of the (designated) groups. If you have registered for a group in VUnet, you are expected to attend all sessions (eight). If you decide to withdraw from the course, please do so in time. This all will avoid a 'fail' on your grade list for not taking part in this course and allows other students to fill in a possible very wanted group spot.

Each semester, one or more open/general groups also take place (with a minimum of 18 participants), for which students may register instead of the designated group for their master programme. Students are advised to consult their schedule carefully, since overlap may occur. For more information, please check course code AM_471023.

Remarks
- To do well, students are expected to attend all lessons. Group schedules are to be found at rooster.vu.nl and on Blackboard.
- If you (expect to) miss a session, please inform the group trainer as soon as possible. If you miss a session without notification, you may not be able to finish the course.
- For any questions concerning this course, please contact onderwijsbureau.beta@vu.nl.

Specialisation

Course code	O_MLVERD ()
Period	Period 2+3
Credits	3.0
Faculty	Fac. der Gedrags- en Bewegingswetensch.
Coordinator	dr. A. Handelzalts
Examinator	dr. A. Handelzalts
Teaching staff	drs. J.K.W. Riksen, drs. H.R. Goudsmit, drs. Y.G. Meindersma, drs. W.S. Hoekstra, drs. S. Donszelmann, dr. H.B. Westbroek, C.L. Geraedts, drs. A. Krijgsman, drs. K.L. Schaap, W. Maas, F.L. de Vries MSc, drs. H. Stouthart, drs. I. Pauw, drs. C.D.P. van Oeveren
Teaching method(s)	Seminar,
Level	500

Statistical Genetics for Gene Finding

Course code	AM_1040 ()
Period	Period 1
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	dr. J.J. Hottenga
Examinator	dr. J.J. Hottenga
Teaching staff	dr. J.J. Hottenga, dr. A. Abdellaoui MSc
Teaching method(s)	Lecture, Computer lab
Level	500

Course objective
Provide practical skills for genetic linkage and association studies to analyse neurological disorders.

Course content
The first part of the course will focus on parametric - and non-parametric linkage analysis in pedigrees, with special emphasis on Mendelian inheritance of complex phenotypes and the possible ways to analyze these data. In current and future genetics, linkage analysis remains an essential tool to analyse pedigrees for research as well as clinical genetics. The knowledge required is essential for any geneticist.

The second part of the course will concentrate on genome-wide association studies (GWAS). With the advent of SNP microarray-chips that can map an essential part of the common genetic variance, GWAS have been playing a significant role in the field of genetics for the last couple of years. With higher resolution than the classical linkage studies, GWAS have been able to uncover many variants with small effects on complex traits.
Besides teaching the main theoretical concepts underlying GWAS and linkage analysis, this course also includes the hands on training needed to handle the large amounts of data and statistical tests. In the practical you will prepare your data, run GWAS and linkage analyses, learn how to visualize and interpret the output and distinguish real signal from noise. The practicals include the use of Merlin, Qtdt, Plink, haploview, WGA-viewer, Galaxy, SPSS.

Form of tuition
Lectures, practical hands-on computer training.
Note that the lectures will be essential to answer most of the examined knowledge.
Contact hours: 4x2 hours lecture + 4x4 hours practicals.
First two weeks: Linkage
Second two weeks: GWAS

Type of assessment
Written exam about linkage and GWAS (75%)
Written homework Assignment GWAS (25%)

Course reading
Statistical Genetics: Gene Mapping Through Linkage and Association. Neale BM, Ferreira MAR, Medland SE, & Posthuma D (Eds.) Taylor and Francis, London (2007). (ISBN 9780415410403)

Abecasis GR, Cardon LR and Cookson WO. A General Test of Association for Quantitative Traits in Nuclear Families. Am J Hum Genet (2000) 66:279-292.

Abecasis GR, Cherny SS, Cookson WO and Cardon LR. Merlin-rapid analysis of dense genetic maps using sparse gene flow trees. Nat Genet (2002) 30:97-101.

Fulker DW, Cherny SS, Sham PC, Hewitt JK. Combined linkage and association sib-pair analysis for quantitative traits. Am J Hum Genet. 1999 Jan;64(1):259-67.

Purcell S, Neale B, Todd-Brown K, Thomas L, Ferreira MAR, Bender D, Maller J, Sklar P, de Bakker PIW, Daly MJ & Sham PC (2007) PLINK: a toolset for whole-genome association and population-based linkage analysis. American Journal of Human Genetics, 81.

David J. Balding. A tutorial on statistical methods for population association studies. Nature Reviews Genetics. (2006) 7:781-791

Thomas A. Pearson; Teri A. Manolio. How to Interpret a Genome-wide Association Study. JAMA. 2008;299(11):1335-1344

Joel N.Hirschhorn and Mark J.Daly. Genome-Wide Association Studies for Common Diseases and Complex Traits. Nature Reviews Genetics. (2005) 6:95-108.

Treva K. Rice, Nicholas J. Schork, and D. C. Rao. Methods for Handling Multiple Testing. Advances in Genetics, Vol. 60, chapter 12.

Robert Plomin, Claire M. A. Haworth and Oliver S. P. Davis. Common disorders are quantitative traits. Nature Reviews Genetics, published online 27 october 2009.

John P. A. Ioannidis, Gilles Thomas and Mark J. Daly. Validating, augmenting and refining genome-wide association signals. (2009). Nature Reviews Genetics. 10:318-329.

Peter M. Visscher, Matthew A. Brown, Mark I. McCarthy, and Jian Yang. Five Years of GWAS Discovery. The American Journal of Human Genetics 90, 7–24, January 13, 2012

Additional literature involving recent techniques will be announced on Blackboard two weeks in advance of the course.

Entry requirements
Basic Statistics.

Recommended background knowledge
Behavioral Genetics (AM_470732) & Complex Trait Genetics (AM_470733) &

Target group
Any person interested in analyzing human DNA in relation to heritable (complex) traits: e.g., geneticists, molecular biologists.

Remarks
Additional useful information can be obtain from the following website links:
http://pngu.mgh.harvard.edu/~purcell/plink/download.shtml
http://www.sph.umich.edu/csg/abecasis/Merlin/index.html
http://www.sph.umich.edu/csg/abecasis/qtdt/index.html

System Neurosciences

Course code	AM_470712 ()
Period	Period 2
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	prof. dr. T.J. de Vries
Examinator	prof. dr. T.J. de Vries
Level	500

Course objective
- Understanding of approaches to study the central nervous system in an integrated and multidisciplinary way with a strong focus on how the complexity of the brain is required for complex behaviour.
- The ability to write a research proposal from a system neuroscience perspective

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.
Contact hours: 24
Selfstudy 48

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

Course reading
Kandel ER, Schwartz JH, Jessell TM Principles of Neural Science, 2000, 4th edition, McGraw Hill, ISBN 0-07-112000-9. All chapters
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.

Entry requirements
Principles of Neuroscience or similar advanced neuroscience course

Recommended background knowledge
Basic neuroscience

Remarks
Guest lecturers: Prof dr Kees Stam, Prof dr Cyriel Pennartz, Prof dr Jeroen Geurts, dr Ysbrand van der Werf, dr Jamie Peters, dr Matthew Self

Teaching Methodology Biology I

Course code	O_MLVDBII ()
Period	Period 1+2
Credits	3.0
Language of tuition	Dutch
Faculty	Fac. der Gedrags- en Bewegingswetensch.
Coordinator	C.L. Geraedts
Examinator	C.L. Geraedts
Teaching staff	C.L. Geraedts
Teaching method(s)	Seminar
Level	500

Teaching Methodology Biology II

Course code	O_MLVDBIII ()
Period	Period 1+2
Credits	6.0
Faculty	Fac. der Gedrags- en Bewegingswetensch.
Coordinator	C.L. Geraedts
Examinator	C.L. Geraedts
Teaching staff	C.L. Geraedts
Teaching method(s)	Seminar
Level	500

Teaching Practice I

Course code	O_MLPRAKI ()
Period	Period 1+2+3
Credits	15.0
Faculty	Fac. der Gedrags- en Bewegingswetensch.
Coordinator	ir. E.J.F. Scheringa
Examinator	ir. E.J.F. Scheringa
Level	500

Teaching Practice II

Course code	O_MLPRAKII ()
Period	Period 1+2+3
Credits	15.0
Faculty	Fac. der Gedrags- en Bewegingswetensch.
Coordinator	ir. E.J.F. Scheringa
Examinator	ir. E.J.F. Scheringa
Level	500

Viral Oncogenesis

Course code	M_OVIRONC03 (311168)
Period	Period 4
Credits	3.0
Language of tuition	English
Faculty	VUmc
Coordinator	prof. dr. P.J.F. Snijders
Examinator	prof. dr. P.J.F. Snijders
Teaching method(s)	Lecture
Level	500

Course objective
The aim of the course is to give students an up-to-date insight into the mechanism of viral oncogenesis in humans.

Course content
The subjects of the course may include several of the following issues:
General aspects of DNA and RNA tumour viruses
Human papillomavirus (HPV) and cervical cancer
Hepatitis B/C viruses (HBV/HCV) and hepatocellular carcinoma
Human papillomavirus (HPV) and non-melanoma skin cancer
Epstein Barr virus (EBV) in lymphoma and carcinoma
Human Herpes Virus 8 (HHV8) and Kaposi's sarcoma

Form of tuition
6-12 contact hours. In addition the course consists of independent learning on the basis of a literature study on selected topics. Introduction session with basic lectures will be provided by the teachers. Question time with the teachers to decide in consultation.

Type of assessment
The course will be concluded by group presentations on literature studies (3 hours). Moreover, findings on literature studies should be summarized in a short written summary to be delivered at the end of the course.

Course reading
Literature consists of recent (review) papers in the field of viral oncogenesis.

Target group
This course is optional for students of the Master Course in Oncology who have completed three compulsory courses of the Master Course in Oncology.

Registration procedure

Students can register for this course and examinations via vunet.vu.nl (under My study, register for courses and exams). The general VU registration rules apply. Information on registration deadlines can be found in VUnet. Please note that the general VU rules are strict, both for booking of the classes and (resit-)exams.

Remarks
After the course the students will have thorough knowledge and in depth insight into:
the fundamental processes which play a role in viral oncogenesis
the mechanisms of the various oncogenic viruses the translation of fundamental research into clinical applications Apply per email to the coordinator of the Master's Programme in Oncology.