



Neurosciences MSc

Vrije Universiteit Amsterdam - Fac. der Aard- en Levenswetenschappen - M Neurosciences (research) - 2014-2015

The aim of the Master programme Neurosciences is to provide students with the knowledge, skills and insight required to operate as an independent professional within the field of neurosciences and to be a suitable candidate for a subsequent course of study leading to a career in research. Having completed the programme, the student should have developed a critical scientific approach and an awareness of the ethical and societal aspects of neurosciences.

The Master programme Neurosciences at the VU University Amsterdam is a joint initiative of the Faculty of [Earth and Life Sciences](#), the [Faculty of Psychology and Education](#) and the [VU University Medical Center](#). It includes both fundamental and clinical aspects of the neurosciences, behavioural and quantitative genetics, as well as neurogenomics. The programme is embedded in Neuroscience Campus Amsterdam and thereby offers you the chance to integrate the full range of neuroscience disciplines.

You will study facets of neurosciences ranging from genes to behaviour, from both fundamental and clinical perspectives. In our [study programme](#) we have constructed six tracks, each designed to give you the perfect start as a researcher in a particular field of neurosciences.

The year schedule can be found at the [FALW-website](#).

Further information about the MSc programme [Neurosciences](#).

A complete programme description can be found at the [FALW-website](#).

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Expired programme components Neurosciences

The course programme components presented in the list below will no longer be part of the examination programme in academic year 2014-2014.

Vakken:

Naam	Periode	Credits	Code
Gene Hunting	Ac. Jaar (september)	6.0	AM_470729
Statistical Genetics for Gene Finding		5.0	AM_470734

MSc Neurosciences, year 1

The first year consists of compulsory courses, to give you a thorough grounding in relevant disciplines. These courses are followed by a 5-month work placement. You will have a wide range of work placement opportunities to choose from, within the VU University Amsterdam and affiliated institutes.

Vakken:

Naam	Periode	Credits	Code
Behavioral Genetics	Periode 2	6.0	AM_1006
Clinical Neurosciences	Periode 2	6.0	AM_1005
From Molecule to Mind	Periode 1	12.0	AM_1004
Internship Neurosciences I	Ac. Jaar (september)	27.0	AM_471108
Neurogenomics	Periode 3	6.0	AM_1007
Writing a Research Proposal	Ac. Jaar (september)	3.0	AM_1123

MSc Neurosciences, year 2

The second year consists of optional courses, to expand your knowledge of certain areas. We have constructed six tracks, which give you a perfect start as a researcher in a particular field of neurosciences.

Opleidingsdelen:

- [MSc Neurosciences, Track Animal Behavior and Systems Neurosciences](#)
- [MSc Neurosciences, Track Clinical Neurosciences](#)
- [MSc Neurosciences year 2 compulsory](#)
- [MSc Neurosciences, General optional modules](#)
- [MSc Neurosciences, Track Medical and Behavioural Genomics](#)
- [MSc Neurosciences, Track Neurogenomics](#)
- [MSc Neurosciences, Track Neurophysiology](#)
- [MSc Neurosciences, Track Psychophysiology](#)

MSc Neurosciences, Track Animal Behavior and Systems Neurosciences

Vakken:

Naam	Periode	Credits	Code
Methods in Behavioral Neurosciences	Periode 1	6.0	AM_470728
Neurobiology of Animal Behaviour	Periode 1	6.0	AM_471018
Neuronal Networks in Vivo	Periode 2	6.0	AM_1001
System Neurosciences	Periode 2	6.0	AM_470712

MSc Neurosciences, Track Clinical Neurosciences

Vakken:

Naam	Periode	Credits	Code
Advanced Clinical Neurosciences	Periode 1	6.0	AM_1014
Experimental and clinical neuroendocrinology	Periode 2	6.0	AM_470700
Functional Brain Imaging	Periode 1	6.0	AM_470715
Neuro- and Psychopharmacology	Periode 2	6.0	AM_470718

MSc Neurosciences year 2 compulsory

Vakken:

Naam	Periode	Credits	Code
Internship Neurosciences II	Ac. Jaar (september)	25.0	AM_471109
Literature Survey Neurosciences	Ac. Jaar (september)	8.0	AM_471110
Neurophilosophy and Ethics	Periode 3	3.0	AM_1018

MSc Neurosciences, General optional modules

Vakken:

Naam	Periode	Credits	Code
Advanced Clinical Neurosciences	Periode 1	6.0	AM_1014

Advanced Human Neurophysiology	Periode 2	6.0	AM_1003
Advanced Neurogenomics	Periode 1	6.0	AM_470717
Complex Trait Genetics	Periode 2	6.0	AM_470733
Developmental Neurobiology of the Vertebrate Brain	Periode 2	6.0	AM_470713
Experimental and clinical neuroendocrinology	Periode 2	6.0	AM_470700
Functional Brain Imaging	Periode 1	6.0	AM_470715
Genomic Data Analysis	Periode 2	6.0	AM_1008
Live Cell Imaging	Periode 1	6.0	AM_470726
Methods in Behavioral Neurosciences	Periode 1	6.0	AM_470728
Neuro- and Psychopharmacology	Periode 2	6.0	AM_470718
Neurobiology of Animal Behaviour	Periode 1	6.0	AM_471018
Neuronal Networks in Vivo	Periode 2	6.0	AM_1001
Psychophysiology	Periode 1	6.0	AM_470736
Statistical Genetics for Gene Finding	Periode 1	6.0	AM_1040
Synaptic and Cellular Neurophysiology	Periode 1	6.0	AM_1009
System Neurosciences	Periode 2	6.0	AM_470712

MSc Neurosciences, Track Medical and Behavioural Genomics

Vakken:

Naam	Periode	Credits	Code
Advanced Neurogenomics	Periode 1	6.0	AM_470717
Complex Trait Genetics	Periode 2	6.0	AM_470733
Genomic Data Analysis	Periode 2	6.0	AM_1008
Statistical Genetics for Gene Finding	Periode 1	6.0	AM_1040

MSc Neurosciences, Track Neurogenomics

Vakken:

Naam	Periode	Credits	Code
Advanced Neurogenomics	Periode 1	6.0	AM_470717
Developmental Neurobiology of the Vertebrate Brain	Periode 2	6.0	AM_470713

Genomic Data Analysis	Periode 2	6.0	AM_1008
Live Cell Imaging	Periode 1	6.0	AM_470726

MSc Neurosciences, Track Neurophysiology

Vakken:

Naam	Periode	Credits	Code
Advanced Human Neurophysiology	Periode 2	6.0	AM_1003
Live Cell Imaging	Periode 1	6.0	AM_470726
Neuronal Networks in Vivo	Periode 2	6.0	AM_1001
Synaptic and Cellular Neurophysiology	Periode 1	6.0	AM_1009

MSc Neurosciences, Track Psychophysiology

Vakken:

Naam	Periode	Credits	Code
Advanced Human Neurophysiology	Periode 2	6.0	AM_1003
Experimental and clinical neuroendocrinology	Periode 2	6.0	AM_470700
Functional Brain Imaging	Periode 1	6.0	AM_470715
Psychophysiology	Periode 1	6.0	AM_470736

Advanced Clinical Neurosciences

Vakcode	AM_1014 ()
Periode	Periode 1
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	W.D.J. van de Berg BSc
Examinator	W.D.J. van de Berg BSc
Docent(en)	W.D.J. van de Berg BSc
Lesmethode(n)	Hoorcollege, Werkgroep, Werkcollege
Niveau	600

Doel vak

The aim of the Advanced Clinical Neuroscience course is to teach how to design, to perform and critically evaluate clinical neuroscience in which the following concepts play an important role: 1) (endo) phenotyping neurodegenerative disease; 2) improving diagnostic accuracy; 3) tools in human neurosciences; 4) translational neuroscience (from

molecule to mind; and from bedside to bench). Major neurodegenerative diseases like Alzheimer's disease, Parkinson's disease, Multiple sclerosis and Epilepsy will be discussed in depth with a focus on the current challenge of improving diagnostic accuracy.

Inhoud vak

The Advanced Clinical Neuroscience Course will cover the following topics:

- 1) New strategies and innovative approaches to improve diagnosing and phenotyping of Alzheimer, Parkinson or Multiple Sclerosis patients.
- 2) Tools in human neurosciences
- 3) Translation neuroscience: what does the rat brain can tell us about the human mind.
- 4) Clinical epidemiology and statistics
- 5) How to design and perform clinical research with specific attention to neurodegenerative and vascular disorders.

Onderwijsvorm

The basic principles of and challenges in clinical research will be presented in a series of 10 lectures and 2 workshops on cognitive profiling and clinical epidemiology. Small groups will write a research proposal with focus on challenges in diagnosing and (endo)phenotyping patients with neurodegenerative or vascular disorders. During the course all students will be able to do an intern in the outpatient clinic at the VUmc to learn how neurophysiological testing, neuroimaging and other assessments and tools contribute to diagnosis of neurodegenerative diseases. They will attend research meetings in the Alzheimer, Parkinson or Multiple Sclerosis center and attend the multi-disciplinary meeting (MDO). The students will have to study the papers and textbook chapters posted on the blackboard themselves. At the end of the course the students will present their research proposal.

Total number of contact hrs: approximately 20 hrs lectures, 6 hrs practicals, 12 hrs interns, 4 hrs meeting with supervisors, 6 hrs presentations.

Toetsvorm

General attitude during the course (10%). Research proposal on specific challenge related to phenotyping or diagnostic criteria for neurological disorders (30%). Presentation of research proposal at the end of the course (30%). Written exam in last week of course (30%).

Literatuur

A number of relevant reviews, peer-reviewed articles and information concerning phenotyping and diagnosis of patients with neurodegenerative diseases which will be posted on Blackboard.

Vereiste voorkennis

Principles of Neuroscience (470701), Clinical Neuroscience (470757)

Doelgroep

Msc Neuroscience students, 2nd year following Track Clinical Neurosciences.
Other Msc Neuroscience students with interest in Clinical Neurosciences.

Intekenprocedure

Registration via VUnet before 1st of July 2014.

Overige informatie

There is maximum of 24 students. For further information and application, please contact the course coordinator: dr. W.D.J. van de Berg or drs. Hanneke Hulst (advancedclinicalneuroscience@vumc.nl)

Advanced Human Neurophysiology

Vakcode	AM_1003 ()
Periode	Periode 2
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. K. Linkenkaer Hansen
Examinator	dr. K. Linkenkaer Hansen
Docent(en)	dr. D.J.A. Smit, dr. K. Linkenkaer Hansen
Lesmethode(n)	Hoorcollege, Werkgroep, Computerpracticum
Niveau	600

Doel vak

At the end of the course the student should be able to:

1. Prepare a subject for an EEG measurement and understand acquisition settings such as sampling frequency, filters, impedance, etc.
2. Explain how the human brain generates scalp electroencephalographic (EEG) signals, both ongoing oscillations and event-related potentials (ERPs).
3. Analyze both ongoing (spontaneous) and ERP data using MATLAB toolboxes.
4. Understand the principles and give examples of these techniques as applied in various scientific and medical fields, including sleep research, brain-computer interfacing, and genetics.
5. Explain the principle of inverse modeling and outline the possibilities and limitations based on own experiences.
6. Apply state-of-the-art time-series techniques to M/EEG data and understand their interpretation as a biomarker and genetic marker for cognition and psychopathology,
7. Perform quantitative and statistical analysis of own data and use the results to make conclusions about the relation between brain activity and cognition/behavior.
8. Summarize the results of your research on a poster and present and defend the interpretation. Thus, you will acquire theoretical and practical experience with EEG.
9. Make an informed decision as to continue a specialization in M/EEG as part of his/her PhD training.

Inhoud vak

The course aims to provide you with the skills to perform an electrophysiological experiment from beginning to end. This requires highly practical skills in the preparation of subjects and use of highly sensitive/expensive equipment, proficiency in the state-of-the-art signal analysis techniques, and a broad theoretical knowledge of how the human neurophysiology can be studied with the techniques of magneto- and

electroencephalography. The generating mechanisms of EEG oscillations and ERPs are treated in detail, as well as the theory behind digital signal processing. This will include frequency decomposition of the EEG (Fourier analysis), time-frequency analysis (wavelet), filtering, and methods to quantify temporal and spatial correlations (i.e., Detrended Fluctuation Analysis and cross-channel synchrony, respectively).

An important component of the course is to teach you how to perform high-density EEG recordings and to analyze these signals with classical as well as more recent non-linear methods. You will work in small groups to record, analyze and present both data on EEG its cognitive/behavioral correlates at the end of the course. 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.

Onderwijsvorm

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

Toetsvorm

EEG/ERP data collection under supervision; analysis and presentation of data on research poster (40%). Written examination (60%).

Literatuur

Steven J. Luck 'An introduction to the event-related potential technique'. (Boston: The MIT press). Chapters 1, 3 and 4.

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.

Aanbevolen voorkennis

Brein en Medicijn and/or Humane Neurofysiologie.

Doelgroep

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

Advanced Neurogenomics

Vakcode	AM_470717 ()
Periode	Periode 1
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	prof. dr. M. Verhage
Examinator	prof. dr. M. Verhage
Niveau	600

Doel vak

This course aims to introduce modern techniques in the integrated Neurosciences via hands-on experience. The use of these techniques is embedded in short research projects and typically covers a number of steps: first clone a construct, then culture and transfect a cell with this construct and finally analyze a functional consequences of this modification using functional assays. Alternatively, research projects may also start with the intact brain and then work down to the molecular networks of proteins and genes, for instance using proteomics and mRNA expression profiling. Although centered around genomics, many functional assays are offered, from electronmicroscopy and protein chemistry to life cell imaging, electrophysiology and behavioural analyses. Various tools and technologies will be explained in supporting lectures and used in order to answer questions related to the function of genes in the nervous system and how they contribute to higher order processes important for functioning of circuitry or behavior.

End terms:

Profound insight and experience with neurogenomic techniques that are used during the course

Adequate design, execute, and interpret a neurogenomic experiment

Good oral presentation (2 oral presentations)

Inhoud vak

This is a largely practical course. You will be executing a small research project aimed at illustrating today's research into gene-function relations. The experiments involve gene expression analysis (transcripts, proteins), and genotypic and phenotypic analysis (genotyping, cell biology, behavior). Theoretical underpinning of concepts and methods will be achieved by using examples from recent literature. The Neurogenomics course (MN 1st year) is obligatory for

this course.

Onderwijsvorm

Lectures, discussion of papers, demonstrations, practicals
16x8h practicals, presentations and discussion
4x8h self study

Toetsvorm

Examination and presentations of the work performed. Evaluation on the basis of 2 oral presentations by the students and their performance during the practical work and during (plenary) discussions.

Literatuur

Articles from journals that published in the last couple of months (2-4 per student)
Purves Neuroscience (5th edition) as reference book
Literature can be studied during the course and will be provided at the start of the course.

Vereiste voorkennis

Neurogenomics

Overige informatie

E-mail: matthijs@cncr.vu.nl

Behavioral Genetics

Vakcode	AM_1006 ()
Periode	Periode 2
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	R.S.L. Ligthart
Examinator	R.S.L. Ligthart
Docent(en)	dr. C.M. Middeldorp, R.S.L. Ligthart
Lesmethode(n)	Hoorcollege, Computerpracticum
Niveau	400

Doel vak

To provide the Master of Neuroscience students with a solid basis in human behavioral genetic research. This entails:

- A good understanding of the most commonly used methods in behavioral genetics (including twin studies, genetic linkage and genome-wide association studies)
- The ability to critically read and understand behavioral genetic research articles
- Familiarity with the most important research findings in the field
- Familiarity with the most common software programs used in this field of research.

Inhoud vak

Behavior genetics focuses on the inheritance of individual differences in complex traits. Such traits are most likely influenced by multiple genetic and environmental factors. The effects of genetic and environmental factors may be additive or interactive and lead to

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

Onderwijsvorm

Lectures (6, 2 hours each) and computer practicals (6, 3 hours each).

Toetsvorm

Written exam consisting of open-end questions (60%) + writing assignment (40%).

To obtain a final grade of 6 or higher, students have to pass both the exam and the writing assignment.

Literatuur

Research articles, exact reading list to be announced on blackboard 2 weeks before the course.

Vereiste voorkennis

Students from disciplines other than neuroscience should contact the course coordinator to discuss the possibility of entry in this course.

Doelgroep

First year students of the master neuroscience and students interested in behavioral genetic research (e.g. twin studies or gene-finding methods, with a focus on behavioral phenotypes).

Overige informatie

Attending the practicals is compulsory

Clinical Neurosciences

Vakcode	AM_1005 ()
Periode	Periode 2
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	M.M. Schoonheim
Examinator	M.M. Schoonheim
Docent(en)	dr. J.J.G. Geurts, M.M. Schoonheim
Lesmethode(n)	Hoorcollege, Practicum
Niveau	400

Doel vak

To provide an overview of the pathology, diagnostic process and therapeutic options for dementias, movement disorders, multiple sclerosis, childhood white matter disorders and neuropsychiatric disorders.

Inhoud vak

Dementias:

Description of the main clinical manifestations of dementia.

Introduction of cognitive assessment in dementias. Demonstration of the neuropathological features of dementias.

Movement disorders:

Description of the motor and cognitive manifestations of movement disorders. During this course the focus will be on Parkinson's disease.

Multiple sclerosis:

Description of the clinical phenotypes of the disease. Introduction of neuroimaging specifically adapted for MS. The use of neuropathology to understand disease mechanisms in MS.

Childhood white matter disorders:

Introduction in MRI pattern recognition in childhood white matter disorders. Demonstration of translational research: from patient to gene, protein and treatment.

Neuropsychiatric disorders:

Description of the clinical manifestation of the main neuropsychiatric disorders in a broad translational way; from molecule to mind.

Introduction of the underlying neuroanatomy and pathophysiology and discussion on what the use is of neuroimaging in neuropsychiatry.

Onderwijsvorm

Lectures, student presentations, practical

The course is four weeks, and also includes a tour of the Netherlands Institute for Neuroscience (NIN)

Toetsvorm

Written exam with open questions

Literatuur

Research papers and course slides provided on blackboard

Vereiste voorkennis

All students following the masters program in Neurosciences at the VU are required to take this course.

External candidates are also allowed.

Aanbevolen voorkennis

For external candidates, some basic knowledge of neuroanatomy would be very helpful.

Doelgroep

Students interested in clinical neuroscience

Intekenprocedure

Through the VU FALW office

Overige informatie

Questions: clinicalneuroscience@vumc.nl

Complex Trait Genetics

Vakcode	AM_470733 ()
Periode	Periode 2
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	prof. dr. D.I. Boomsma
Examinator	prof. dr. D.I. Boomsma
Docent(en)	prof. dr. D.I. Boomsma
Lesmethode(n)	Hoorcollege
Niveau	500

Doel vak

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.

Inhoud vak

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.

Onderwijsvorm

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

Toetsvorm

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 empirical paper; (try to) read it.

Indicate what is unclear to you. At the end of this course you will be 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.

Literatuur

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 glycaemic traits and provide insight into the underlying biological pathways. *Nat Genet.* 44(9):991-1005, 2012

Vereiste voorkennis

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

Aanbevolen voorkennis

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

Doelgroep

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

Overige informatie

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.

Developmental Neurobiology of the Vertebrate Brain

Vakcode	AM_470713 ()
Periode	Periode 2
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. R.F.G. Toonen
Examinator	dr. R.F.G. Toonen
Docent(en)	dr. R.F.G. Toonen, prof. dr. R.E. Koes
Lesmethode(n)	Hoorcollege
Niveau	500

Doel vak

This course will give 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 general and brain development, positional information systems such as the hox genes, mitogenic activity of embryonic and adult stem cells in relation to neurogenesis, neuronal migration, neuronal differentiation, axonal growth, synapse formation, critical periods of development and experience dependent plasticity during embryonic and adult life. These topics are discussed while considering the adequate research technology and will be addressed during hands-on lab work using cultured neurons.

Inhoud vak

Lectures, seminars, master classes. The first two weeks will be shared with the Master Developmental Biology and consist of lectures on general developmental biology in the first week and developmental neurobiology in the second. The last two weeks will focus on master classes from experts in the field of developmental neurobiology 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.

Onderwijsvorm

Week 1&2: Lectures and seminars. These first two weeks will be shared with the Master Developmental Biology and will consist of lectures on general developmental biology in week 1 and developmental neurobiology in week 2. These 2 weeks will be examined during a mid-term exam.

Week 3&4: Lectures,, master classes and hands-on practicals. Focus 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

Toetsvorm

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.

Literatuur

Handouts will be distributed at the beginning of the course

Vereiste voorkennis

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

Doelgroep

2nd Master of Neuroscience or equivalent

Intekenprocedure

Maximum number of students is 20.

For further information and application, please contact: Dr. R. Toonen (r.f.g.toonen@vu.nl)

Overige informatie

Guest lecturers:

Dr. R. Meredith CNCR/FALW

Dr. M. Verheije CNCR/FALW

Dr. V. Heine VUmc

Experimental and clinical neuroendocrinology

Vakcode	AM_470700 ()
Periode	Periode 2
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. C.B. Lambalk
Examinator	dr. C.B. Lambalk
Docent(en)	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
Lesmethode(n)	Hoorcollege, Practicum
Niveau	500

Doel vak

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.

Inhoud vak

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.

Onderwijsvorm

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

Toetsvorm

Written examination; open questions.

Literatuur

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.

Vereiste voorkennis

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

Overige informatie

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

Maximum nr. of participants 25.

From Molecule to Mind

Vakcode	AM_1004 ()
Periode	Periode 1
Credits	12.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. G.J. Schenk
Examinator	dr. G.J. Schenk
Docent(en)	prof. dr. M. Verhage, prof. dr. H.D. Mansvelder, prof. dr. A.B. Smit, dr. D.J.A. Smit, dr. G.J. Schenk
Lesmethode(n)	Hoorcollege, Computerpracticum, Practicum
Niveau	400

Doel vak

Providing the master student, independently of your primary training, with a solid basis in cell biology, neurophysiology, functional neuroanatomy, genetics and statistics.

Inhoud vak

The first two weeks will be used to brush up your knowledge of molecular and cellular neurobiology and statistics, in particular SPSS. Lectures and computer labs in this period are not compulsory, but if you have limited knowledge of these fields, you are strongly urged to attend these lectures and computer labs. The lectures are scheduled in such a way that you can attend all lectures in both fields. Weeks 3-6 will be used to deepen your knowledge in neurophysiology, genetics and functional neuroanatomy. As a guidance we will use the four research programs of the Neuroscience Campus Amsterdam, i.e. Attention and Cognition, Addictive Behavior, Anxiety and Depression, and Neurodegeneration. Keynote lectures related to these research programs, will be given throughout this 4 week period during lunch breaks.

Onderwijsvorm

First two weeks: 40 lectures, 18 h computer lab
Weeks 3-6: 51 lectures, 12 h computer lab, 10 h brain dissection
Week 7: 8 h lab rotation

Toetsvorm

Written progress exam (beginning week 3): 10% of final grade
Written final exam (covering week 3-8) consisting of open questions: 90% of final grade

Literatuur

B Alberts et al., Essential Cell Biology, 2009, 3rd edition, Garland Science, ISBN 978-0-8153-4130-7 (paperback)

A. Field, Discovering Statistics Using SPSS, 2009, 3rd edition, SAGE publications, ISBN 978-1847879073

D. Purves et al. Neuroscience, 2012, 5th edition, Sinauer associates INC, ISBN 9780878936953

Practical guide : Human Neuroanatomy. Macroscopic dissection of the brain

Recent papers/reviews to be handed out during the course.

Vereiste voorkennis

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

Overige informatie

Except for the first two weeks, all lectures, practicals, demonstrations and computer labs are compulsory. For further information, please contact Dr Geert J. Schenk (g.schenk@vumc.nl)

Functional Brain Imaging

Vakcode	AM_470715 ()
Periode	Periode 1

Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. P.J.W. Pouwels
Examinator	dr. P.J.W. Pouwels
Lesmethode(n)	Computerpracticum, Hoorcollege
Niveau	500

Doel vak

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.

Inhoud vak

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).

Onderwijsvorm

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.

Toetsvorm

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)

Literatuur

- 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.

Vereiste voorkennis

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

Doelgroep

Students following 2nd year master-tracks Clinical Neurosciences or Psychophysiology.

Students with other background, please first contact coordinator.

Overige informatie

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)

Gene Hunting

Vakcode	AM_470729 ()
Periode	Ac. Jaar (september)
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	prof. dr. D. Posthuma
Examinator	prof. dr. D. Posthuma
Docent(en)	dr. Z. Bochdanovits, P. Heutink
Lesmethode(n)	Hoorcollege, Computerpracticum, Practicum
Niveau	500

Doel vak

To provide students with a solid base of molecular genetic approaches to identify the responsible genes for human traits and disorders.

End terms:

- students can run a genome wide association by themselves
- students can critically read GWAS studies
- students have good insight into molecular approaches that can be used for functional genetic studies
- students are aware of the differences between Mendelian and complex traits and the consequences for statistical and functional analyses

Inhoud vak

The course will address the various aspects of positional cloning approaches (gene hunting) and functional assays for identified mutations and will address the following topics:

- Genome variation
- Molecular finemapping (tools and methods) SNPs, STRs
- Copy number variation
- From statistics to biology
- Mutation analysis
- Genome browsers
- Epigenetics
- Biological effects of mutations
- Functional assays

Onderwijsvorm

Lectures and discussion (25 hrs) , computer practicals (20 hrs), and self study (24-40 hrs)

Lecture and computer practicals each represent 50% of the course.

Toetsvorm

Weekly reports (30%), presentation (30%) and assignments (40%)

Literatuur

Human Molecular Genetics 4, Strachan and Read + handouts for computer practical

Vereiste voorkennis

Master course Behavior Genetics

Aanbevolen voorkennis

Statistics, genetics

Doelgroep

Master students

Overige informatie

(Minimum # students: 25)

Genomic Data Analysis

Vakcode	AM_1008 ()
Periode	Periode 2
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen

Coördinator	dr. P. van Nierop
Examinator	dr. P. van Nierop
Docent(en)	dr. P. van Nierop, dr. Z. Bochdanovits
Lesmethode(n)	Hoorcollege, Computerpracticum
Niveau	500

Doel vak

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

Inhoud vak

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.

Onderwijsvorm

Lectures (20 hr), practicals (15 hr)

Toetsvorm

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

Literatuur

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

Vereiste voorkennis

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

Doelgroep

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).

Overige informatie

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

Internship Neurosciences I

Vakcode	AM_471108 ()
Periode	Ac. Jaar (september)
Credits	27.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. W.J.A.J. Smeets
Niveau	600

Doel vak

The aim of a Master's Neurosciences internship is to learn to independently conduct neuroscientific research. At the end of an internship the student

- is able to independently find scientific information and knows how to analyse, summarize and critically evaluate this for the benefit of his or her own research question.
- is able to use the principles from different disciplines in the design of research plans, the execution of research, and the analysis of the results.
- has command of the relevant research techniques and laboratory procedures, including safety procedures and the ability to solve emerging problems.
- has command of the use of computer software relevant for the field.
- is able to communicate experimental results in a scientific article in English, and by means of an oral presentation.
- can analyse and evaluate planning, execution and results of research independently and critically.
- is able to collaborate with researchers of various disciplines.
- can contribute to scientific discussions about plans, results and consequences of research.
- can reflect on ethical aspects of research and applications of research.
- can evaluate his or her own functioning in the internship, both by reflection and in discussions with others.
- has obtained a good impression of a potential future field of

career.

Inhoud vak

Writing research proposal and report (scientific article in English), conducting experiments and analyses, presenting and discussing data.

Onderwijsvorm

The day-to-day supervisor teaches the student the necessary neuroscientific research techniques/tools and analysis tools and regularly provides feedback on the performance of the student.

The day-to-day supervisor and/or first assessor also aid in the student's development of the following skills, by means of formative assessment

- academic skills (incl. insight and creative thinking)
- scientific writing skills
- presenting skills
- attitude

Toetsvorm

Written research proposal (GO/NO-Go decision after 6 weeks: decision on whether the project and the student both have enough potential to continue)

Final grade: attitude & execution (25%), oral presentation (25%), written report (assessor 1: 25%; assessor 2: 25%)

Literatuur

Starting literature is provided by the supervisor.

Vereiste voorkennis

Student has to have obtained at least 18 ECTS from the MSc Neurosciences program before the internship can commence.

Doelgroep

First year MSc Neurosciences students

Intekenprocedure

Via the master coordinator (Application and agreements form).
The student sends the master coordinator a signed Application and Agreement form incl. a research proposal at least four weeks before the start of the internship. The internship can commence as soon as the master coordinator has approved the project.

Internship Neurosciences II

Vakcode	AM_471109 ()
Periode	Ac. Jaar (september)
Credits	25.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. W.J.A.J. Smeets
Niveau	600

Doel vak

The aim of a Master's Neurosciences internship is to learn to independently conduct neuroscientific research. At the end of an internship the student

- is able to independently find scientific information and knows how to analyse, summarize and critically evaluate this for the benefit of his or her own research question.
- is able to use the principles from different disciplines in the design of research plans, the execution of research, and the analysis of the results.
- has command of the relevant research techniques and laboratory procedures, including safety procedures and the ability to solve emerging problems.
- has command of the use of computer software relevant for the field.
- is able to communicate experimental results in a scientific article in English, and by means of an oral presentation.
- can analyse and evaluate planning, execution and results of research independently and critically.
- is able to collaborate with researchers of various disciplines.
- can contribute to scientific discussions about plans, results and consequences of research.
- can reflect on ethical aspects of research and applications of research.
- can evaluate his or her own functioning in the internship, both by reflection and in discussions with others.
- has obtained a good impression of a potential future field of career.

Inhoud vak

Writing research proposal and report (scientific article in English), conducting experiments and analyses, presenting and discussing data.

Onderwijsvorm

The day-to-day supervisor teaches the student the necessary neuroscientific research techniques/tools and analysis tools and regularly provides feedback on the performance of the student.

The day-to-day supervisor and/or first assessor also aid in the student's development of the following skills, by means of formative assessment

- academic skills (incl. insight and creative thinking)
- scientific writing skills
- presenting skills
- attitude

Toetsvorm

Written research proposal (GO/NO-Go decision after 6 weeks: decision on whether the project and the student both have enough potential to continue).

Final grade: attitude & execution (25%), oral presentation (25%), written report (assessor 1: 25%; assessor 2: 25%).

Literatuur

Starting literature is provided by the supervisor.

Vereiste voorkennis

The student needs to have finished Internship Neurosciences I before Internship Neurosciences II can commence.

Doelgroep

Second year Master's Neurosciences students.

Intekenprocedure

Via the master coordinator (Application and agreements form).

The student sends the master coordinator a signed Application and Agreement form incl. a research proposal at least four weeks before the start of the internship. The internship can commence as soon as the master coordinator has approved the project.

Literature Survey Neurosciences

Vakcode	AM_471110 ()
Periode	Ac. Jaar (september)
Credits	8.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. L. Diergaarde
Niveau	600

Doel vak

The students writes a review paper and gives an oral presentation on this topic.

The student is able to

[this applies to both review paper and oral presentation]

- plan and complete tasks involved in writing the review paper in an efficient and independent manner
- select relevant literature
- generate ideas and concepts on own
- provide a well-structured overview of the literature (including: concise summary; coherent theoretical framework; clear hypothesis; fully, systematically and accurately presented findings)
- analyse and evaluate findings in a critical manner
- draw appropriate conclusions and formulate implications of the findings for further theoretical development

[this applies to the review paper only]

- write a review paper with virtually no language or spelling errors
- use a clear writing style

[this applies to the oral presentation only]

- present in an enthusiastic and convincing manner
- use clear and effective visual aids
- listen to questions, answer questions in a respectful manner
- devote enough time to each key point
- respect the time allotted for the presentation

Inhoud vak

- Writing of a neuroscientific review paper in English, thereby providing an overview of the literature
- Oral presentation of this review paper, including discussion

Onderwijsvorm

Assessor 1 provides formative feedback on the writing process and on the review paper itself.

Toetsvorm

Assessor 1: 50% (writing process + review paper + oral presentation),
assessor 2: 50% (review paper)
The review paper is independently assessed by the 2 assessors.

Literatuur

The student is responsible for collecting scientific articles. The supervisor can aid the student in this process, if necessary.

Vereiste voorkennis

The student has to have successfully completed Internship Neurosciences I before the Literature survey can commence.

Doelgroep

Second year Master's Neurosciences students

Intekenprocedure

Via the master coordinator (Application and agreements form).
The student sends the master coordinator a signed Application and Agreement form incl. a short description of the literature survey at least four weeks before the start of the Literature survey course. The course can commence as soon as the master coordinator has approved the proposal and the agreements.

Live Cell Imaging

Vakcode	AM_470726 ()
Periode	Periode 1
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. R.F.G. Toonen
Examinator	dr. R.F.G. Toonen
Lesmethode(n)	Hoorcollege
Niveau	500

Doel vak

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

Inhoud vak

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 neuropeptide 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.

Onderwijsvorm

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

Toetsvorm

Oral presentations (50%) and Exam (50%)

Students need to pass both parts (grade > 5.5) to obtain final grade.

Literatuur

Course co-ordinators will provide:

- Selected chapters from Live Cell Imaging. A laboratory Manual.

Editors: Goldman and Spector.

- Selection of primary scientific papers

Vereiste voorkennis

1st year Master of Neuroscience or equivalent.

Course is also open to non-VU neuroscience students.

Please send email to course coordinators with study program details for eligibility check.

Doelgroep

2nd year Master Neuroscience students of equivalent.

Intekenprocedure

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).

Overige informatie

Guest lecturers:

Dr. C. Lohman NIN, KNAW

Methods in Behavioral Neurosciences

Vakcode	AM_470728 ()
Periode	Periode 1
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. R.O. Stiedl
Examinator	dr. R.O. Stiedl
Niveau	500

Doel vak

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.

Lecturers include Drs. Sabine Spijker, Maarten Loos and Tommy Pattij as experts in their scientific fields.

Inhoud vak

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
- Experimental approaches to study addictive behavior
- Autonomic functions in behavior as index of emotion
- Studying executive functions in behavior
- Home cage-based phenotyping of mice
- Spatial learning tests in rodents: clues and pitfalls
- Neural aspects of spatial orientation

Onderwijsvorm

Lectures, partly with demonstrations, and discussion based on primary research papers.

Toetsvorm

Student presentation from a spectrum of related topics (15%) and written examination with open-ended questions (85%) determine the final grade. In both assessment forms the minimal grade has to be 5.5 to pass the course.

Literatuur

Primary literature (papers) generally provided through digital blackboard.

Vereiste voorkennis

Basic knowledge of animal behavior.

Doelgroep

MSc. Biology and MSc. Neuroscience students

Neuro- and Psychopharmacology

Vakcode	AM_470718 ()
Periode	Periode 2
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. M.M.M. Wilhelmus
Lesmethode(n)	Hoorcollege
Niveau	600

Doel vak

Principal aim of the course is to provide the student with sufficient insight into the basic principles of Neuro- and Psychopharmacology, in order to enable the student to independently formulate ideas and concepts which may lead to the development of innovative drug therapies. The subjects of the course are largely drawn from research themes of the Neuroscience Campus Amsterdam of the Vrije Universiteit and VU University Medical Center.

Specific aims:

- A) Students are able to describe the pathology of the disease and know which biological mechanisms are the driving forces underlying the pathology.
- B) Students are capable of pinpointing possible therapeutic entries of the disease, and can argue whether and how the therapy will affect these therapeutic entries.
- C) Students are able to defend and motivate their therapeutic strategy in front of fellow students and teachers.

Inhoud vak

Current pharmacotherapy of well known neurologic- and psychiatric disorders is based on the use of drugs of which the development has been guided by, often unproven, hypotheses concerning the pathophysiology of these diseases. As a result, despite a few "success

stories", in most cases this has led to the introduction of suboptimally effective compounds. Moreover, these "therapeutics" do not cure the disease, but merely act to ameliorate the symptoms. However, in light of the increasing knowledge concerning the pathogenesis of brain disorders, it now seems highly feasible that in the near future drugs will be developed which will target the core of the disease process.

During the course, a small number of lectures will provide the student with detailed knowledge and insight into the hypotheses that have guided the development of the current generation of neuro- and psychopharmaceuticals. Subsequently, the student will be expected to 1) independently identify the strong points and weaknesses of these hypotheses, and 2) use the conclusions of this evaluation, in combination with recent developments in the field, to formulate a well-based proposal for the development of a new pharmacotherapy for a specific brain disease.

Onderwijsvorm

Lectures (approximately 19h), progression meeting with supervisor (3h) and writing a thesis and preparing presentation (approximately 96h). In total, the students are expected to invest a workload of 40 hour each week during this course.

Toetsvorm

Pharmacology exam (1/4 of mark, in writing), writing (1/2 of mark) and public presentation (1/4 of mark) of thesis.

Literatuur

- "Medical Pharmacology at a Glance"; M.J. Neal, Fifth Edition (Blackwell Science 2005), ISBN 0-632-05244-9; Chapters 1-4, 6-9, 22, 24-28 and 31.
- "Rang and Dale's Pharmacology"; H.P. Rang, M.M. Dale, J.M. Ritter, R.J. Flower, Sixth Edition (Churchill Livingstone-Elsevier 2007), ISBN 0-443-06911-5; Chapters 1-3, 6 and 56.
- Additional texts provided during the course

Vereiste voorkennis

Medical Pharmacology course or equivalent.

Overige informatie

A maximum of 24 students can be accommodated in the course. Preference is given to students who participate in the Master of Neuroscience program of the VU University Amsterdam. Course is taught in English. For further information please contact dr. M. Wilhelmus (m.wilhelmus@vumc.nl).

Neurobiology of Animal Behaviour

Vakcode	AM_471018 ()
Periode	Periode 1
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. R.O. Stiedl
Examinator	dr. R.O. Stiedl
Niveau	500

Doel vak

The course will give an overview of research topics of the neural basis of animal behavior from sensory perception to specific behaviours. In this course we will study of a number of model systems from insects to mammals with partly human aspects for psychiatric disorders related to stress. I will do this by critically reviewing both recent literature and a number of classical papers. The course is designed for students who already have a basic knowledge of neurobiology and behavior.

Inhoud vak

When we study the neural basis of behavior we investigate how, in a biological setting, nervous systems generate behavior in specific functional contexts. This is done by combining evolutionary and comparative approaches to the study of nervous system function on a systems level.

Questions that we will address are:

- 1) How do neural circuits cause different species-specific behaviors?
- 2) How can we compare the nervous systems of different animals in this respect?
- 3) What exactly are the sensory worlds of the different animals and how do environmental factors contribute to the different behaviours?
- 4) How do environmental conditions alter the phenotype in animals and what are the adaptive and functional mechanisms?

The following topics will be studied from neurons via brain areas to behavior:

- Ultimate and proximate questions to study behavior
- Emotional learning and anxiety in rodents
- Echolocation in bats (t.b.d.)
- Locomotion and pattern generation principles (t.b.d.)
- Escape behavior in the cockroach and the crayfish (t.b.d.)
- Auditory communication in insects
- The tactile world of the star-nosed mole and the rat
- Olfactory systems and behavior
- Dominance, hormones and stress

Onderwijsvorm

Lectures with discussion and demonstrations/movies

Toetsvorm

Student presentation from a spectrum of related topics (15%) and written examination with open-ended questions (85%) determine the final grade. In both assessment forms the minimal grade has to be 5.5 to pass the course.

Literatuur

Primary literature (papers) generally provided through digital blackboard.

Vereiste voorkennis

Basic knowledge of animal behavior.

Doelgroep

MSc. Biology and MSc. Neuroscience students.

Neurogenomics

Vakcode	AM_1007 ()
Periode	Periode 3
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	prof. dr. A.B. Smit
Examinator	prof. dr. A.B. Smit
Lesmethode(n)	Hoorcollege, Werkgroep, Computerpracticum
Niveau	500

Doel vak

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

Inhoud vak

The course will address the various aspects of functional analysis of the genome, by addressing the following topics:

- The search for genes and gene variants which are underlying neuronal physiology and pathology, including forward genetics and gene-hunting strategies
- Functional analysis of genes through reverse genetics
- Gene expression analysis of neuronal cells and brain areas (gene expression profiling)
- The analysis of proteins (proteomics) and complexes thereof.
- Simulation of genetic and protein networks
- The introduction of various model organisms relevant for neurogenomics research, such as, man, mouse, Drosophilla, C. elegans, and zebrafish.

Onderwijsvorm

Lectures, experiments, workshops, student presentations, computer practicals

Toetsvorm

Written examination, open end questions. Practical task, presentation and literature evaluation.

Literatuur

To be announced on Blackboard

Vereiste voorkennis

Bachelor Biology, Biomedical Sciences, Psychology with profile Biological Psychology or Neurophysiology

Intekenprocedure

Students need to enroll via VUnet
 Students not enrolled in the VU master's in Neurosciences, need to contact the course coordinator prior to enrollment

Overige informatie

Language: tuition in English

Neuronal Networks in Vivo

Vakcode	AM_1001 ()
Periode	Periode 2
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. C.P.J. de Kock
Examinator	dr. C.P.J. de Kock
Docent(en)	dr. C.P.J. de Kock
Lesmethode(n)	Werkgroep
Niveau	600

Doel vak

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

Inhoud vak

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

Onderwijsvorm

Lectures 11 hours 25% 1.5 ECTS
 Demo's in vivo experiments 16 hours 38% 2.3 ECTS
 Histology workshop 8 hours 19% 1.1 ECTS
 Cell identific. workshop 2 hours 5% 0.3 ECTS
 Final presentations 5 hours 12% 0.8 ECTS

Total 42 hours 100% 6.0 ECTS

Toetsvorm

- 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 categories: 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%).

Literatuur

Oberlaender et al, Cereb Ctx 2012
Egger et al, PLoS Comp Biol 2012
Markram et al, Nat.Neurosci 2006
Hill et al, PNAS 2012

Vereiste voorkennis

To be announced

Doelgroep

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

Overige informatie

Guest Lecturers:

Hemanth Mohan, MSc, FALW
Roel de Haan, MSc, FALW
Anton Pieneman, FALW
Keerthi Kumar, FALW

Neurophilosophy and Ethics

Vakcode	AM_1018 ()
Periode	Periode 3
Credits	3.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	prof. dr. G. Glas
Examinator	prof. dr. G. Glas
Lesmethode(n)	Hoorcollege
Niveau	500

Doel vak

This course gives an introduction into philosophical and ethical issues that are part of neuroscientific research and of the application of neuroscientific insights in professional practices and in the communication with the general public.

Final attainment level: at the end of the course the student is able

- To identify logical errors in scientific papers
- To understand and reproduce four positions in the debate about the relation between brain and mind
- Point out the differences between the concepts of cause, explanation, law, correlation
- To identify 'reification' and scientific reasoning
- To give an ethically informed account of the relation between scientific research and the industry
- To provide a summary statement about the role of the scientist in educating the general public.

Inhoud vak

Part 1. Philosophy of science and methodology (6 hours)

This part of the course addresses questions like

- what is science?
- what do concepts like cause, explanation, and law mean?
- what is the difference between correlation and causation? how can one discern different types of relation: lawlike relations, statistical relations; covariations
- when do statistical relations say anything about reality?
- hypothesis-driven research versus bottom-up 'data-driven' research
- explanation of terms: inference to the best explanation, post hoc explanation, validation (different types of validation)

Part 2. Basic concepts(6 hours)

This part of the course addresses questions like

- what is mind?(including the notion of 'extended mind')
- what is relation between mind and brain? (with an introduction into the conceptual history of this relationship)
- what is embodiment?
- what is a gene (the gene as 'fuzzy' concept)?
- conceptualizations of complexity (system theory; neurophilosophy)

Part 3. Ethical issues (4 hours)

This part of the course gives an introduction to basic concepts and to current approaches of ethics. Special attention to issues like

- informed consent, especially in neurological and psychiatric patients
- intertwinement between science and industry
- neurosurgery (in OCD and Parkinson's disease)
- brain implants

Part 4. Educating the public (4 hours)

This part of the course is devoted to the position of the scientist who is asked to inform the general public. What can be said on the basis of neuroscience research and what not? Is it for example legitimate for a scientist to say

- that God does not exist
- that we have no free will
- that morality is nothing but a product brain wiring
- what is the status of evolutionary explanations in the public sphere?

Onderwijsvorm

20 hours interactive Interactive lectures (in English), video, discussion of the literature, 'Lagerhuys debate', pitching

Toetsvorm

Each student gives a brief presentation about his or her research project and discusses one or two philosophical issues with respect to his project.(the grade for this presentation forms 1/3 of the final grade). The other 2/3 of the is based on a final paper, which provides a brief summary of the main issues that are discussed and a two page account of a particular philosophical or ethical problem (question, possible answers, discussion of philosophical/ethical resources to answer the question, conclusion).

Literatuur

Will be provided two months before the beginning of the course.

Aanbevolen voorkennis

Students are advised to read an introduction into philosophy

Doelgroep

Students in research master Neuroscience

The lectures are also open for other students, on special request

(decisions about permission will be taken case by case)

Psychophysiology

Vakcode	AM_470736 ()
Periode	Periode 1
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	prof. dr. J.C.N. de Geus
Examinator	prof. dr. J.C.N. de Geus
Docent(en)	prof. dr. J.C.N. de Geus
Lesmethode(n)	Werkgroep, Practicum, Hoorcollege
Niveau	400

Doel vak

- 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.

Inhoud vak

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.

Onderwijsvorm

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

Toetsvorm

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

Literatuur

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

Vereiste voorkennis

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

Aanbevolen voorkennis

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

Doelgroep

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

Intekenprocedure

The 'studiesecretariaat FALW' (tel. 020-5987010 / 020-5986939; e-mail: studiesecretariaat@falw.vu.nl ; room C118 (W&N-gebouw) handles course and exam enrollment and registration of grades (see TIS website).

Overige informatie

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.

Statistical Genetics for Gene Finding

Vakcode	AM_470734 ()
Credits	5.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. J.J. Hottenga
Examinator	dr. J.J. Hottenga
Docent(en)	dr. J.J. Hottenga
Lesmethode(n)	Hoorcollege, Computerpracticum
Niveau	500

Doel vak

Provide practical skills for genetic linkage and association studies

Inhoud vak

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. The second part of the course will concentrate on genome-wide association studies (GWAS). With the advent of SNP microarray-chips that can map the largest 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, PLINK, haploview, WGA-viewer, Galaxy, SPSS.

Onderwijsvorm

Lectures, practical hands-on computer training

Toetsvorm

Weekly assignments (25%) & exam (75%). Practical needs to be completed in order to obtain a final grade.

Literatuur

To be announced on Blackboard

Vereiste voorkennis

Behavioral Genetics (AM_470732) & Complex Trait Genetics (AM_470733)

Statistical Genetics for Gene Finding

Vakcode	AM_1040 ()
Periode	Periode 1
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. J.J. Hottenga
Examinator	dr. J.J. Hottenga

Docent(en)	dr. J.J. Hottenga
Lesmethode(n)	Hoorcollege, Computerpracticum
Niveau	500

Doel vak

Provide practical skills for genetic linkage and association studies

Inhoud vak

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.

Onderwijsvorm

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

Toetsvorm

Written exam

Literatuur

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.

Vereiste voorkennis

Behavioral Genetics (AM_470732) & Complex Trait Genetics (AM_470733) & Basic Statistics.

Aanbevolen voorkennis

Variance components analysis, regression analysis.

Doelgroep

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

Overige informatie

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>

Synaptic and Cellular Neurophysiology

Vakcode	AM_1009 ()
Periode	Periode 1
Credits	6.0

Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. L.N. Cornelisse
Examinator	dr. L.N. Cornelisse
Niveau	500

Doel vak

To provide a theoretical basis for the understanding and measurement of electrical activity and neuronal communication in the brain and to gain hands-on experience with electrophysiological techniques.

Inhoud vak

A thorough introduction to electrophysiology and an understanding of the basic biophysics underlying (the study of) electrical activity in the brain at a cellular level. The first two weeks of the course will be dedicated to lecture classes with problem-solving exercises, and practicals to put theory into practice. Following this, students will acquire patch-clamping techniques and complete mini lab projects in the last two weeks, presenting their findings at the end of the course.

Onderwijsvorm

Lectures: 20 hrs

Practicals: 28 hrs

Mini project: 100 hrs

Toetsvorm

Theoretical exam 50%

Mini project 25%

Presentation 25%

Literatuur

Provided at the course

Aanbevolen voorkennis

Basic understanding of physics and mathematics

Doelgroep

Students with an interest in electrophysiology and/or high-end methods for functional analysis of brain genes

Intekenprocedure

Course will only proceed with 4 or more students enrolled

Overige informatie

Mini projects are performed in groups of 2-3 students with a supervisor and aimed at learning how to perform a successful electrophysiology experiment, and subsequent analysis, interpretation and presentation of the data.

System Neurosciences

Vakcode	AM_470712 ()
Periode	Periode 2
Credits	6.0
Voertaal	Engels

Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	prof. dr. T.J. de Vries
Examinator	prof. dr. T.J. de Vries
Niveau	500

Doel vak

- 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

Inhoud vak

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.

Onderwijsvorm

Lectures, homework assignments, presentations, and tutored discussions.
Contact hours: 24
Selfstudy 48

Toetsvorm

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

Literatuur

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.

Vereiste voorkennis

Principles of Neuroscience or similar advanced neuroscience course

Aanbevolen voorkennis

Basic neuroscience

Overige informatie

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

Writing a Research Proposal

Vakcode	AM_1123 ()
Periode	Ac. Jaar (september)
Credits	3.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	M. van den Hoorn
Examinator	M. van den Hoorn
Lesmethode(n)	Werkgroep

Doel vak

The aim of this course is to provide Master's students with the essential linguistic know-how for composing a successful research proposal 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 research proposal;
- know what the information elements are in parts of their research proposal;
- know how to produce clear and well-structured texts on complex subjects;
- 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 how to cite sources effectively;
- know what their own strengths and weaknesses are in writing;
- know how to give effective peer feedback.

Inhoud vak

The course will start with a general introduction to writing a research proposal in English. Taking a top-down approach, we will then analyse the structure of a research proposal in more detail. As we examine several sections of a research proposal, 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:

- What makes a good proposal?
 - o 5 crucial questions you must always answer
 - Considering you readers: who are they? What do they expect? How do they read your text? How does that affect your writing?
 - The importance of considering reading strategies
 - What is the basic structure of a research proposal and what are they key elements of each section?
 - How do you "sell" your project / research? Why language matters!
- Strategies for writing successful research proposals: using the English language effectively and enhancing readability
- o Keeping it brief: don't waste words
 - o Writing well-structured and coherent paragraphs
 - o Writing effective sentences (sophisticated word order,

information distribution)

- o Using modality and boosters to your advantage
- o Using appropriate and effective vocabulary
- o Arguing convincingly
- o Using active constructions (but also using the passive effectively)
- Understanding grammar (tenses, basic word order, agreement, prepositions, etc.)
- Understanding punctuation
- Referring to sources: summarising, paraphrasing, quoting (how and when?)
- Avoiding plagiarism

Onderwijsvorm

Research proposal writing in English is an eight-week course that consists of 2 contact hours a week. Students are required to spend at least 6 to 8 hours of homework per week. They will work through a phased series of exercises that conclude with the requirement to write several text parts (e.g. Introduction/Background, Relevance section, Summary). Feedback on the writing assignments is given by the course teacher and by peers.

Toetsvorm

Students will receive 3 course credits when they meet the following requirements:

- Students hand in three writing assignments (e.g. Introduction, Relevance section, Summary) and get a pass mark for all writing assignments;
- Students provide elaborate peer feedback;
- Students attend at least 7 out of 8 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.

Literatuur

Effective Scientific Writing: An Advanced Learner's guide to Better English, 2nd edition (June 2013) (A. Bolt & W. Bruins, ISBN 978 90 8659 617 1). VU bookstore: €27.95.

Doelgroep

Students MSc Neurosciences

Intekenprocedure

For this course, both a general VUnet registration and Blackboard group enrollment is necessary.