

First year courses

## **Research Master Specialisation Drug Development & Neurohealth Year 1**

Faculty of Psychology and Neuroscience

### **Introduction to Molecular Biochemical Techniques**

#### **Full course description**

This course focuses on fundamental biological concepts including cellular organisation, DNA, RNA and proteins. Additionally, this course provides students with a conceptual understanding of the most important concepts in molecular neuroscience. Students are made familiar with selected aspects of molecular biology that provide the non-specialist with the principles for understanding the structure and functional relationships of molecular biology techniques.

#### **Course objectives**

Students will be able to understand:

cell biology, molecular biology, biochemistry, regulation of gene and protein transcription, research methods in molecular cell biology and vocabulary (e.g. scientific and technical words).

Students will be able to apply:

acquisition of basic laboratory techniques, including preparation of buffers, pipetting, pH titration, a protein assay (standard curve), RNA extraction and DNA isolation, conventional PCR.

#### **Prerequisites**

This introductory course is required for students with a psychological background. The parallel course PSY4312 is required for students with a biological background. Thus, students enroll in either PSY4311 or PSY4312. The course coordinators of both courses evaluate which of the two courses a student is required to take.

PSY4311

Period 1

2 Sep 2019

27 Sep 2019

[Print course description](#)

ECTS credits:

5.0

Instruction language:

Research Master Cognitive and Clinical Neuroscience, specialisation Drug Development and Neuro Health English

Coordinator:

- [G.R.L. Kenis](#)

Teaching methods:

Lecture(s), Presentation(s), Research, Skills, PBL

Assessment methods:

Attendance, Participation, Final paper, Written exam

Keywords:

RNA, DNA, protein, ELISA, RIA, PCR, Western blot

Faculty of Psychology and Neuroscience

## Practical Training: Genes and Proteins

### Full course description

This practical training provides students with a practical understanding of the most important techniques in molecular neuroscience. Students are made familiar with selected aspects of molecular biology that provide the non-specialist with the principles for understanding the structure and functional relationships of molecular biology techniques. This includes basic laboratory techniques such as pipetting, pH titration and a protein assay. Specific techniques performed in the lab are DNA/RNA isolation and analysis, DNA synthesis and PCR.

### Course objectives

Students will be able to understand:

- standard techniques in molecular research laboratories;
- acquaintance with terms of molecular biology/biochemistry.

PSY4341

Period 1

2 Sep 2019

25 Oct 2019

[Print course description](#)

ECTS credits:

0.0

Instruction language:

English

Coordinator:

- [G.R.L. Kenis](#)

Teaching methods:

Paper(s), Research, Skills, Work in subgroups

Assessment methods:

Attendance, Final paper

Keywords:

General laboratory techniques, RNA, DNA isolation, protein purification, ELISA, PCR/ RT-PCR, Western blot

# Introduction to Psychology

## Full course description

In this course students acquire an overview of human cognitive psychology. A selected number of psychological themes are covered, surveying knowledge on how humans act and interact, how they differ from each other, how they reason and speak and how they 'know' things. The course focuses on 'normal' human performance, but malfunction and psychopathology are also covered. The major emphasis of the course is on understanding human behaviour by means of cognitive, non-biological theories and paradigms.

## Course objectives

Students will be able to understand:

- psychological methods and designs;
- cognition, perception, personality, behaviour, consciousness.

## Prerequisites

This introductory course is required for students with a biological background. The parallel course PSY4311 is required for students with a psychological background. Thus, students enroll in either PSY4311 or PSY4312. The course coordinators of both courses evaluate which of the two courses a student is required to take.

PSY4312

Period 1

2 Sep 2019

27 Sep 2019

[Print course description](#)

ECTS credits:

5.0

Instruction language:

English

Coordinator:

- [E.L. Theunissen](#)

Teaching methods:

Lecture(s), Assignment(s), Paper(s), PBL, Presentation(s)

Assessment methods:

Attendance, Final paper, Participation

Keywords:

Introduction, behaviour, cognition, Psychology

Faculty of Psychology and Neuroscience

# Practical Training: Measuring Cognitive Functions

## Full course description

You will conduct an experiment in which you will test the effect of a (psychoactive) manipulation on cognitive functioning. You will also participate as a test subject in the experiments of your fellow students. Next, you have to analyse the data collected during the experiment and present the results to your fellow students.

## Course objectives

Students will be able to understand:

- psychological experiment, measuring cognitive functions;
- data analysis;
- presenting (poster or oral).

PSY4353

Period 1

2 Sep 2019

25 Oct 2019

[Print course description](#)

ECTS credits:

0.0

Instruction language:

English

Coordinator:

- N.R.P.W. Hutten

Teaching methods:

Research

Assessment methods:

Attendance, Participation

Keywords:

Cognitive functions; psychological experiment.

Faculty of Psychology and Neuroscience

## Medical Needs & Failures, Target Discovery

### Full course description

Students will become acquainted with existing treatments, current and new targets in Neuroscience, i.e. how current knowledge of neuropsychiatric disease processes relates to existing medicinal drugs and research and development of new medicinal drugs. In this course we will focus on identifying neurobiological substrates of major Neuropsychiatric diseases such as Alzheimers Disease and Schizophrenia for which there still exist largely unmet medical needs, because of incomplete or absent treatment efficacy. This will be annotated with examples from the literature.

For example in Alzheimers Disease only symptomatic pharmacological treatments are available

Research Master Cognitive and Clinical Neuroscience, specialisation Drug Development and Neuro Health  
While to date there is extensive research and development of novel disease modifying biologics treatments. This is a therapeutic area where many clinical trials have failed in the recent past. Ongoing investigations focus on vaccine or antibody treatments aimed at clearance or prevention of amyloid plaques and neurofibrillary tangles in order to obtain primary prevention therapies. Some attention will also be paid to drug development for rare diseases, specifically Autism. How to investigate the neural substrates that may be treatable with drugs, is unravelled by the Research Diagnostic Criteria (RDoC) project. Potential applications for RDoC have recently expanded to treatment development and clinical trials, given its potential for circuit-based treatment targets as compared to trials using current categories that suffer from excessive heterogeneity and questionable validity.

## Course objectives

Students will understand:

- the similarities and differences between biomarkers (e.g. in Alzheimers Disease: brain amyloid obtained by PET-scan), disease targets (amyloid volume in Alzheimers Disease), drug targets (amyloid in temporal lobe area) and clinical targets (memory performance);
- the principles and the levels of aggregation (from molecule to behavioural function) in the RDoC framework;
- the public/private collaboration in Autism Drug Development (EU-AIMS);
- human pharmacological models of psychotic symptoms as method for drug screening.

PSY4818

Period 1

30 Sep 2019

18 Oct 2019

[Print course description](#)

ECTS credits:

3.0

Instruction language:

English

Coordinator:

- R. Schreiber

Teaching methods:

Lecture(s), Assignment(s), PBL, Presentation(s)

Assessment methods:

Attendance, Presentation, Final paper

Keywords:

target identification, target validation, disease dissection

Faculty of Psychology and Neuroscience

## Advanced Statistics I

### Full course description

The course consists of six units. In the first four units, participants will be given an in-depth training in the following standard statistical methods: factorial ANOVA for between-subject designs, analysis of covariance (ANCOVA), multivariate ANOVA (MANOVA), discriminant analysis and multiple linear

Research Master Cognitive and Clinical Neuroscience, specialisation Drug Development and Neuro Health Regression. Students are assumed to have background knowledge of balanced two-way factorial ANOVA and multiple regression. These methods will be briefly reviewed. The following advanced topics will then be covered: unbalanced factorial designs, contrast analysis, interaction, simple slope analysis, dummy coding, centring covariates, different coding schemes, collinearity and residuals checks and data transformation. The distinction between confounders and mediators in regression and ANCOVA is also discussed, forming a bridge from regression to structural equations modelling (SEM). The latter is an advanced multivariate method that is gaining importance in psychology but still requires special software (such as Lisrel, EQS, AMOS or Mplus). SEM is introduced in two units, starting with causal modelling and mediation analysis in cross-sectional research and then extending to longitudinal research and latent variables (factors). Special attention is given to identifying models, model equivalence, global and local goodness of fit indices, parsimony, model modification and cross-validation. Some concepts from matrix algebra are needed for SEM, and these will be briefly discussed without going into technical detail.

## Course objectives

Students are able to understand:

oneway analysis of variance, contrast analysis, unbalanced designs, multivariate analysis of variance, discriminant analysis, linear regression with interaction terms, linear regression with dummy variables, data transformations, simple slope analysis, analysis of covariance, path analysis, structural equation modeling, confirmatory factor analysis, structural models with latent variables.

PSY4106

Period 1

2 Sep 2019

20 Dec 2019

[Print course description](#)

ECTS credits:

3.0

Instruction language:

English

Coordinator:

- [J. Schepers](#)

Teaching methods:

Assignment(s), Lecture(s), Skills, Training(s)

Assessment methods:

Attendance, Written exam

Keywords:

Univariate analysis of variance, multivariate analysis of variance, regression analysis, structural equation modeling

Faculty of Psychology and Neuroscience

## Practical Training: SPSS I and Lisrel

### Full course description

In order to make practical use of the statistical models that form the topic of the Advanced Statistics

Research Master Cognitive and Clinical Neuroscience, specialisation Drug Development and Neuro Health course, researchers must make use of statistical software. This course will utilise the traditional SPSS program, but also the specialised LISREL software. LISREL is a statistical program that allows structural equations models to be tested.

## Course objectives

Students are able to understand:

- defining contrasts;
- building regression models;
- doing multivariate analyses;
- transforming data;
- testing simple slopes;
- creating and testing SEM models.

PSY4119

Period 1

2 Sep 2019

20 Dec 2019

[Print course description](#)

ECTS credits:

0.0

Instruction language:

English

Coordinator:

- [J. Schepers](#)

Teaching methods:

Assignment(s), Training(s)

Assessment methods:

Attendance

Keywords:

SPSS, LISREL, statistical software

Faculty of Psychology and Neuroscience

## Scientific Writing

### Full course description

The course is delivered in a series of one lecture and four tutorials, during which students produce and revise a short research proposal, literature research paper or research article. The lecture aims to cover the structure of the three genres, and ethical issues surrounding the production of scientific texts (for example, plagiarism and non-biased writing). In tutorials, students apply principles in the linguistic sense and discover how these apply to their own writing. In particular, the 'doors and windows' (abstracts, introductions, hypotheses and discussions) of scientific papers are analysed for their linguistic and stylistic content. Furthermore, students develop the language awareness and critical skills required to review their own work as well as that of their peers. The instructor gives individual feedback on parallel block assignments at the end of the course.

## Course objectives

Students are able to understand:

principles of scientific writing, conventions in scientific writing, the structure of scientific texts, ethics in scientific writing, plagiarism, editing skills, ethics, language in scientific writing, academic writing style, coherence in scientific writing, reporting sources

PSY4113

Period 1

2 Sep 2019

25 Oct 2019

[Print course description](#)

ECTS credits:

1.0

Instruction language:

English

Coordinator:

- [P.P.C. Wilms van Kersbergen](#)

Teaching methods:

Assignment(s), Lecture(s), Paper(s), Research, Skills, Training(s), Work in subgroups

Assessment methods:

Attendance, Final paper

Keywords:

Scientific writing, Research proposal, empirical research article, literature review, peer review, language awareness

Faculty of Psychology and Neuroscience

## Introduction in Genetics

### Full course description

While genetic liability to neurological and psychiatric disorders has been established, the search for the responsible genetic factors is still ongoing. This workshop focuses on how genetic variations confer risk of complex diseases. Students will gain insight, by using theoretical models, into how these alterations affect DNA transcription, RNA processing and protein synthesis, ultimately leading to variation in phenotype expression. An initial overview is given of sources of genetic variation, ranging from large scale alterations in the genome structure to common variations such as single nucleotide polymorphisms. Advantages and disadvantages of current strategies in genomic research, such as genome wide association studies, will be examined. Regulation of gene expression including epigenetic processes such as DNA methylation and histone modifications are then discussed. At the end of this course, students will be able to better understand, interpret and critically evaluate recent reports on large scale genetic studies of common complex diseases.

### Course objectives

Students will be able to understand:

genetic variation, polymorphisms, copy number variations, haplotypes, linkage analysis, linkage



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disequilibrium, mendelian inheritance, population genetics, epigenetics, genetics of complex neuropsychiatric diseases, genome wide association studies, regulation of gene expression, DNA methylation, histone modifications, gene-environment interplay, micro-RNA.

PSY4340

Period 1

2 Sep 2019

25 Oct 2019

[Print course description](#)

ECTS credits:

1.0

Instruction language:

English

Coordinator:

- [G.R.L. Kenis](#)

Teaching methods:

Assignment(s), Lecture(s), Presentation(s), Work in subgroups

Assessment methods:

Attendance, Presentation, Final paper

Keywords:

DNA, RNA, genetic variation, polymorphism, gene expression, Genetics, epigenetics, genetic association, heritability

Faculty of Psychology and Neuroscience

## Drug Discovery

### Full course description

Student will become acquainted with the different strategies of drug discovery from early stages in which molecules are screened in low to high throughput screens from representative chemical or virtual libraries; subsequently, the obtained hit molecules are optimized with respect to pharmacodynamics and pharmacokinetics (ADME) to first lead compounds for in vivo testing in healthy animals and animal models of disease; this is followed by further optimization until eventually candidate molecules for registration and clinical development are defined. Patenting may occur at any point along that time-line and has to take the compound life cycle and later clinical development failures into account. Next to small molecule discovery, attention will be given to the recent development of recombinant human(ised) therapeutic antibodies. As a prerequisite for these rather standard processes, classical and possible future strategies of target identification and validation will be presented and analysed. In this context, important issues regarding the translational value of in vitro vs. in vivo models will be discussed.

### Course objectives

Students will be able:

- to give a good rational/definition of a medicinal drug;
- to explain the different targets that drugs can have. This can be receptors, enzymes, second messengers, and biological targets;

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- understand the characteristic features of drugs how they bind to the different type of targets (in the brain);
- to explain how high-throughput screening is done and how different test models can be used for this purpose;
- to explain what the use of in vivo and in vitro models has in the drug discovery program. Students will know the principles of selecting a good test battery for a drug discovery program. They will be able to apply concepts as construct-, external-, and predictive validity;
- to write a research discovery plan starting from novel target, to drug finding, to drug testing;
- to understand the requirements for proposing a drug candidate for clinical development.

PSY4812

Period 2

28 Oct 2019

20 Dec 2019

[Print course description](#)

ECTS credits:

5.0

Instruction language:

English

Coordinators:

- [A. Blokland](#)
- [H.H.H.W. Schmidt](#)

Teaching methods:

PBL, Presentation(s)

Assessment methods:

Attendance, Presentation, Final paper

Keywords:

hit, lead (optimisation), candidate, target engagement, structure activity relationship (SAR), target identification and validation, low-high throughput screening, recombinant antibody, phage display, common mechanisms, ADME

Faculty of Psychology and Neuroscience

## **Drug Metabolism and Safety**

### **Full course description**

This course provides an insight into human drug metabolism at the molecular and cellular level, from pharmacological to toxic levels, and drug safety evaluation processes, ranging from insight into the current safety regulations to novel concepts in safety assessment based on scientific innovations in cell models to replace test animals and in-silico-tools recently developed for a better prediction of drug safety before market introduction. It will also focus on the advantages of personalized medicine, pharmacokinetics and toxicogenomics. It will provide insight into how to extract relevant information such as dose finding and pharmacokinetics, from toxicological datasets (PredTox, TG-GATEs, diXa) and how this can be used to predict (un)safety, related mechanisms and unwanted side effects of different drugs.

## Course objectives

Students will be able to understand:

- pharmacokinetics, drug metabolism, dose finding, ADME concept;
- toxicology, toxicogenomics drug safety evaluation, regulatory requirements.

Skills:

- detection of the differential toxic effects on neuronal cells based on gene expression detected by PCR.

PSY4814

Period 2

25 Nov 2019

13 Dec 2019

[Print course description](#)

ECTS credits:

5.0

Instruction language:

English

Coordinator:

- [J.J. Briedé](#)

Teaching methods:

Assignment(s), Paper(s), PBL, Presentation(s), Skills

Assessment methods:

Attendance, Final paper, Presentation

Keywords:

drug safety, Pharmacokinetics, drug toxicity, in-silico tools

Faculty of Psychology and Neuroscience

## Valorisation

### Full course description

This workshop deals with the theory and practice of valorisation. Valorisation is defined as “The process of value creation from knowledge, by making it applicable and available for economic or societal utilisation, and by translating it in the form of new business, products, services, or processes”. The main item in this workshop is to discover how economic value can be created from neurohealth research. What products, services, and tools with practical applicability and commercial spinoff can be derived from this work? Can we create patents, licenses, startups and/or research collaborations based on new findings? If so, how can this be envisaged? Who could be potential partners and how do we approach them to find appropriate developers, manufacturers, and market parties? What are critical success factors to arrive at a favourable outcome? All of these matters will be dealt with in an interactive setting with students.

### Course objectives

Students will be able to understand:

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- valorisation theory and practice;
- the creation of tangible output from neurohealth research in the form of products, services and/or tools and the role patents, licenses, startups and collaborations can play to arrive at that stage.

PSY4831

Period 2

28 Oct 2019

20 Dec 2019

[Print course description](#)

ECTS credits:

1.0

Instruction language:

English

Coordinators:

- [M.J.G. Govers](#)
- [J.H.H.J. Prickaerts](#)
- R. Schreiber

Teaching methods:

Assignment(s), Lecture(s), PBL, Presentation(s), Work in subgroups

Assessment methods:

Assignment, Attendance

Keywords:

valorisation, value creation, startup, license, patent, collaboration

Faculty of Psychology and Neuroscience

## Big Data in Drug Discovery and Development

### Full course description

This course provides an in-depth insight how to exploit information publicly available in multiple web-based data infrastructures and how to use different software tools for drug discovery, design and further development. It will provide an introduction to how drugs can be designed using tools that can be applied for docking of potential molecular drug structures to protein targets, computerized tools that can be used to calculate properties of drugs (e.g. logP, Molecular Weight, Lipinski Parameters, etc.) and abstracted bioactivities (e.g. binding constants, pharmacology and ADMET). It will also provide insight how to use genomics data for complementing drug structure-activity relationships, including data retrieved from patients, which can be applied for identifying potential targets of drugs. The course also encompasses practical training in using these different in silico tools, which will be used to gather information about potential drugs and of existing drugs.

### Course objectives

Students will be able to understand:

- biomarker discovery, exploring mechanisms, use of omics approaches;
- in-silico modelling, computerized drug-protein interactions and activities;
- training how to use different databases, eTox, ChEMBL, Open Phacts, Open TG-GATEs, diXa, as well as relevant software tools;

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- skills: Computer supported Training in Big Data in Drug Discovery & Development;
- biology underlying fundamental psychological processes.

PSY4819

Period 3

6 Jan 2020

31 Jan 2020

[Print course description](#)

ECTS credits:

3.0

Instruction language:

English

Coordinator:

- [D.G.J. Jennen](#)

Teaching methods:

Assignment(s), Paper(s), PBL, Presentation(s), Skills

Assessment methods:

Attendance, Final paper, Presentation

Keywords:

omics, drug discovery & development, big data, bioinformatics

Faculty of Psychology and Neuroscience

## **Practical Training: Computer supported Training in Big Data in Drug Discovery and Development**

### **Full course description**

Skill training along with Core Course 'Big Data in Drug Discovery & Development'. In this training you'll experience a hands-on approach for modern target identification and validation. You'll get familiar with the tools used in drug target evaluation and perform your own drug target analyses. Furthermore, you'll use genomics data for complementing drug structure-activity relationships and for identifying potential targets of drugs. Finally, you'll use the different data sources to categorise/group drugs via an integrated approach.

### **Course objectives**

Students will be able to understand:

skills in using different in silico tools which will be used to gather information about potential drugs and existing drugs.

PSY4822

Period 3

6 Jan 2020

31 Jan 2020

[Print course description](#)

ECTS credits:

0.0

Research Master Cognitive and Clinical Neuroscience, specialisation Drug Development and Neuro

Health  
Instruction language:

English

Coordinator:

- [D.G.J. Jennen](#)

Teaching methods:

Assignment(s)

Assessment methods:

Attendance, Presentation

Keywords:

omics, drug discovery & development, big data, bioinformatics

Faculty of Psychology and Neuroscience

## Neuroanatomy

### Full course description

The aim of this practical training is to make you acquainted with the neuroanatomical terminology and to gain insight into the spatial and functional organisation of the brain. It is essential to have a basic knowledge of the brain anatomy when working in the field of neuropsychology or neurobiology. Many specific brain areas can be linked to particular functions. Thus, knowledge of the brain anatomy and its main functions allows direct linkage of specific neurological or psychiatric disorders to particular brain areas. After a short theoretical introduction, you will study whole brains and brain material of mammals at both macroscopical (visual inspection) and microscopical level. The emphasis will be on major brain systems, including the basal ganglia and limbic system.

### Course objectives

Students are able to understand:

- organisation of the brain in particular the limbic system and basal ganglia;
- brain dissection;
- microscopical staining techniques.

PSY4108

Period 3

6 Jan 2020

31 Jan 2020

[Print course description](#)

ECTS credits:

1.0

Instruction language:

English

Coordinator:

- [J.H.H.J. Prickaerts](#)

Teaching methods:

Lecture(s), Skills, Work in subgroups

Assessment methods:

Research Master Cognitive and Clinical Neuroscience, specialisation Drug Development and Neuro Health  
Attendance, Written exam

Keywords:

Neuroanatomy, limbic system, basal ganglia

Faculty of Psychology and Neuroscience

## **Drug Discovery & Development Project Management**

### **Full course description**

Background.

A key component of every discovery project is the so-called 'progression scheme'. The stages of such a scheme typically consists of a series of activities, such as target identification and hit finding, with corresponding milestones, such as target selection and the selection of hits. Selection of the right assays, tests and models, and the implementation of relevant criteria for compounds to pass to the next stage is essential for the success of a discovery project. As is management of the compound flow through the various stages.

Project management.

In this hands-on course, the elements of the progression scheme will be explained and how the different activities are connected with each other. Subsequently, students will work in small teams to develop a progression scheme for a defined CNS discovery project. Activities and timelines will be recorded in a simplified Gantt chart. Every team will present their scheme at the end of the workshop.

### **Course objectives**

Students will be able to understand:

- progression scheme;
- target identification & selection;
- target assessment & validation;
- hit finding & identification; high throughput screening;
- lead finding & selection;
- nomination preclinical development candidate;
- Proof of Mechanism & Proof of Concept;
- behavioral models for CNS diseases;
- project management, multidisciplinary teams;
- Gantt chart.

PSY4833

Period 3

6 Jan 2020

31 Jan 2020

[Print course description](#)

ECTS credits:

1.0

Instruction language:

English

Research Master Cognitive and Clinical Neuroscience, specialisation Drug Development and Neuro

Health  
Coordinator:

- [R. Schreiber](#)

Teaching methods:

Lecture(s), Presentation(s)

Assessment methods:

Attendance, Presentation

Keywords:

screening cascade, project stages, filter criteria, project milestones, Gantt chart

Faculty of Psychology and Neuroscience

## Colloquia

### Full course description

Each specialisation organizes two colloquia, in which senior researchers from Maastricht University or visiting lecturers present their scientific insights. Each colloquium focuses in depth on one of a wide range of topics, with issues transcending the courses and specialisations. Each colloquium lecture will be followed by active discussion, chaired by the lecturer or the host of the guest lecturer. A total of twelve colloquia will be offered.

### Course objectives

Students are able to understand:

- key research domains from different specialisations;
- interdisciplinary research.

Students are able to interact with students from different specialisations.

PSY4100

Period 3

6 Jan 2020

3 Jul 2020

[Print course description](#)

ECTS credits:

1.0

Instruction language:

English

Coordinator:

- R. Schreiber

Teaching methods:

Lecture(s)

Assessment methods:

Attendance

Keywords:

interdisciplinary knowledge

Faculty of Psychology and Neuroscience



## Clinical Development

### Full course description

Students will become acquainted with the concept of a clinical development plan and the critical path of studies in early and late development.

### Course objectives

Students will be able to understand:

- target product profile, single ascending dose studies, multiple ascending dose studies, experimental medicine studies, dose finding, proof of concept, efficacy, safety;
- phases of clinical development (I-III) and special cases, i.e. development of anti-cancer drugs and biologicals as models for drug development in neuroscience;
- role of biomarkers in patient stratification, target engagement and outcome/efficacy prediction;
- novel trial formats, e.g. adaptive trials, single-case observations, non-Bayesian statistics;
- relevant outcome parameters versus surrogate parameters;
- recent cases of development failures and reasons;
- drug repurposing and repositioning;
- development pipelines.

PSY4820

Period 4

3 Feb 2020

6 Mar 2020

[Print course description](#)

ECTS credits:

4.0

Instruction language:

English

Coordinator:

- R. Schreiber

Teaching methods:

Lecture(s), Assignment(s), PBL, Presentation(s)

Assessment methods:

Attendance, Presentation, Final paper

Keywords:

drug development, phase I, phase II, phase III, phase IV, proof of concept, dose finding, biomarkers, outcomes, trial design, repurposing/repositioning

Faculty of Psychology and Neuroscience

## Pharmacoepidemiology, Drug Safety & Pharmaceutical Policy

## Full course description

When a new medicine is granted a marketing authorization, its clinical safety profile has been assessed on the basis of results from randomised clinical trials (RCTs). The number of patients recruited for these pre-marketing (Phase-III) trials (in general up to 3,000), is able to detect adverse events that occur with frequencies of up to 1:1000 patient-years. Therefore, it is difficult to adequately assess the risk/benefit profile of a drug for regulatory authorities, such as the US Food and Drug Administration (FDA) or the European Medicines Agency (EMA). The authorities will ultimately decide whether a drug can remain on the market, whether its use will be restricted to certain subgroups of patients or whether it will be entirely pulled off the market. This problem is further enhanced by exclusion criteria for patients enrolled in RCTs, and their short duration of follow-up (generally several months up to 2-3 years). The intake of other medications or inclusion of children, elderly or pregnant women- such as in a real life setting - is often not allowed in RCTs. As a result the EMA and FDA usually request pharmaceutical companies to conduct so called post-authorisation safety (PASS) studies. Similar studies are also conducted by other stakeholders such as academia or drug regulators such as the FDA.

This course will give an overview of the lifecycle of drug development, with a strong emphasis on pharmacoepidemiology in Phase IV research. It will evaluate stakeholders, legislation scientific methods and commonly used data sources to assess the risk-benefit profile of drugs after market authorisation.

## Course objectives

Students will be able to understand:

- the latest developments of the regulatory process of drug development (Phase I-IV);
- common and novel pharmacoepidemiological methods for the conduct of post-authorisation safety studies (PASS). These include meta-analysis, case-control studies, cohort studies, and case-only methods;
- commonly used datasources for the conduct of Phase IV research, including their strengths and limitations;
- risk/benefit assessments by regulatory agencies; pharmacovigilance procedures;
- the interactions between patients, prescribers, and payers (health insurance companies and governments).

PSY4816

Period 4

3 Feb 2020

3 Apr 2020

[Print course description](#)

ECTS credits:

4.0

Instruction language:

English

Coordinators:

- [F. de Vries](#)
- J.H.M. Driessen

Teaching methods:

Lecture(s), PBL

## Advanced Statistics II

### Full course description

The course consists of seven units.

The first three units cover classical repeated measures ANOVA for the one- and two-way within-subject design and the split-plot (between x within) design. Special attention is given to: a) the choice between multivariate and univariate data formats and method of analysis, and the sphericity assumption; b) the distinction between the within-subjects and between-subjects part of a split-plot ANOVA, and how to obtain both using regression analysis; c) the surprising consequences of including covariates into repeated measures ANOVA; and d) the choice between different methods of analysis for randomised versus non-randomised group comparisons.

Subsequently, a further three units are devoted to mixed (multilevel) regression for nested designs and longitudinal studies. This mixed regression starts with a unit on marginal models for repeated measures as an alternative to repeated measures ANOVA in cases of missing data or within-subject covariates. Students are shown the pros and cons of various models for the correlational structure of repeated measures, such as compound symmetry and AR1. The second unit covers the random intercept model for repeated measures as a method to include individual effects in marginal models for longitudinal data (growth curves) or single trial analyses of lab data (response times, ERP, fMRI). Students learn how this can be combined with e.g. ARMA modelling to distinguish between interpersonal and intrapersonal outcome variation. The random intercept model will also be applied to a cluster randomised trial, i.e. an RCT where organisations like schools or companies instead of individuals are randomised. The third and last unit on mixed regression covers random slope models for longitudinal data (individual differences in change over time), single trial analysis (individual differences in stimulus effects) and multicentre trials (RCT within each of a number of organisations).

Finally, the topic of optimal design, sample size and power calculations is introduced in a seventh unit.

### Course objectives

Students are able to understand:

- repeated measures ANOVA for within-subject and split-plot (between x within) designs, including factorial designs and covariates in repeated measures ANOVA;
- mixed (multilevel) linear regression with random effects and autocorrelation;
- optimal design and sample size calculations for experimental and observational studies.

More specifically, students are able to choose the correct method of analysis, and specify a statistical model, for repeated measurements, to compare different models and choose the best model (based on checking assumptions, model fit and parsimony on top of plausibility), and to

Research Master Cognitive and Clinical Neuroscience, specialisation Drug Development and Neuro Health  
Interpret effect estimates and significance tests obtained with that model. Students are furthermore able to choose the correct formula for computing the sample size for basic and often used research designs, and to compute the sample size with that formula.

## Prerequisites

Good understanding of descriptive and inferential statistics at the elementary and intermediate level, including t-tests, factorial ANOVA and multiple linear regression. Skilled in the use of SPSS for statistical data analyses.

PSY4107

Period 4

3 Feb 2020

5 Jun 2020

[Print course description](#)

ECTS credits:

3.0

Instruction language:

English

Coordinator:

- [G.J.P. van Breukelen](#)

Teaching methods:

Assignment(s), Lecture(s), Training(s)

Assessment methods:

Attendance, Written exam

Keywords:

Within-subject designs, repeated measures ANOVA, mixed (multilevel) regression, marginal versus random effects models, optimal design, sample size, power

Faculty of Psychology and Neuroscience

## Practical Training: SPSS II

### Full course description

This practical training forms part of the PSY4107 Advanced Statistics II course. The practical consists of seven sessions in the computer rooms. In the first six sessions SPSS procedures for repeated measures and multilevel data are practised. The goal is to understand how proper analyses of such data can be done using SPSS. In the last session GPower will be used to practice sample size (power) calculations for some elementary research designs.

### Course objectives

Students are able to understand and apply:

- how to run with SPSS: repeated measures ANOVA for within-subject and split-plot (between x within) designs, including factorial designs and covariates;
- how to run SPSS for: mixed (multilevel) linear regression with random effects and autocorrelation;

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- how to use GPower for sample size (power) calculations for your own research (master thesis, grant application).

## Prerequisites

Good understanding of descriptive and inferential statistics at the elementary and intermediate level, including t-tests, factorial ANOVA and multiple linear regression. Skilled in the use of SPSS for statistical data analyses.

PSY4117

Period 4

3 Feb 2020

5 Jun 2020

[Print course description](#)

ECTS credits:

0.0

Instruction language:

English

Coordinator:

- [G.J.P. van Breukelen](#)

Teaching methods:

Training(s)

Assessment methods:

Attendance

Keywords:

Within-subject designs, repeated measures ANOVA, mixed (multilevel) regression, marginal versus random effects models, sample size, power, effect size

Faculty of Psychology and Neuroscience

## Biomedical Brain Imaging

### Full course description

Imaging technologies provide powerful insights into the distribution, binding, and other biological effects of pharmaceuticals. Imaging techniques enable direct assessment of the relationship between drug plasma concentration and target occupancy. Neuroimaging thus enables to possibility to test whether a new chemical entity reaches brain target tissue in sufficient amounts to be pharmacologically active. Therefore, neuroimaging can yield important biomarkers and surrogate endpoints during assessment of disease progression and treatment outcome.

### Course objectives

Using the available literature, student presentations, and lectures, students will be able to understand and explain:

- The basic principles of various brain imaging methods (PET, SPECT, MRI, Optical Imaging, MRS)
- How these approaches are used in clinical drug development stages (target identification,

Research Master Cognitive and Clinical Neuroscience, specialisation Drug Development and Neuro Health (distribution, pharmacokinetics, target binding, drug efficacy, safety, personalized medicine)

- Opportunities and challenges of biomedical imaging techniques during the different phases of drug development will be discussed.

PSY4832

Period 4

3 Feb 2020

3 Apr 2020

[Print course description](#)

ECTS credits:

3.0

Instruction language:

English

Coordinator:

- D.M.J. Hernaus

Teaching methods:

Lecture(s), PBL, Presentation(s), Work in subgroups

Assessment methods:

Attendance, Presentation

Keywords:

biomedical imaging, drug development, PET, SPECT, MRS, ph-MRI

Faculty of Psychology and Neuroscience

## Psychiatric Neuroscience: Psychopharmacology

### Full course description

The main aim of this course is to gain insights into the molecular neurobiology of psychiatric disorders and how these phenotypes can be studied in animal models (i.e. the principle of translation). The first part of this course focuses on the psychobiology of stress, emotions and associated disorders such as depression and anxiety disorders. Chronic and/or excessive stress may lead to the development of psychiatric conditions such as depression and anxiety, diseases in which a patient shows inadequate coping associated with a severe disruption of daily life. A major challenge in research on stress and related disorders is to unravel the molecular basis of persistent changes in behaviour that explain the symptoms of mental illness and their (partial) reversal during treatment. A major focus during the course is on the limbic system, the sympathetic nervous system and the hypothalamo-pituitary-adrenal axis as key players of emotional regulation in health and disease. Furthermore, the roles of different neurotransmitter systems such as the serotonergic system will be discussed in depth. The second part of the course deals with the neurobiology of major psychotic disorders such as schizophrenia. In particular, this course addresses the molecular processes that influence psychosis-related cognitive domains from a translational point of view. Students will also study the mechanisms by which adverse environmental exposures de-regulate key brain structures that influence the mesocorticolimbic dopaminergic system - a core phenomenon in psychosis pathophysiology.

### Course objectives

Students will be able to understand:

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psychobiology of stress, neurobiology of psychiatric disorders, anxiety, anxiety disorders, panic disorder, major depression, psychosis, schizophrenia, molecular psychiatry, gene-environment (GxE) interactions, environmental exposure, functional neuroanatomy, (neuro)psychiatric (endo)phenotypes, animal models for psychiatric disorders, translational neuropsychiatry, the pathophysiology of mental disorders, hypothalamic-pituitary-adrenal axis, mesocorticolimbic system.

PSY4840

Period 5

6 Apr 2020

8 May 2020

[Print course description](#)

ECTS credits:

5.0

Instruction language:

English

Coordinators:

- [G.R.L. Kenis](#)
- [D.L.A. van den Hove](#)

Teaching methods:

Assignment(s), Lecture(s), Paper(s), PBL, Presentations, Work in subgroups

Assessment methods:

Attendance, Final paper, Presentation, Written exam

Keywords:

stress, depression, Anxiety disorders, panic disorder, schizophrenia, gene-environment (GxE) interactions

Faculty of Psychology and Neuroscience

## **Practical Training: Western Blotting: A Pharmacological Perspective**

### **Full course description**

The objective of this practical is to learn the principles of working with in-vitro model systems and to use Western Blotting to measure protein levels. After an introduction, students will design their own small research project. During the entire course, students work on this project and conduct the necessary experiments. Students use human cell lines to examine the neuroplastic/toxic effects of stress hormones (e.g. cortisol) in relation to molecular biological changes. The effects on neurotrophic factor signaling are determined by Western Blotting.

### **Course objectives**

Students will be able to understand:

western blotting, cell culture, neuroplasticity, psychopharmacology, protein chemistry, psychobiology of stress, neurobiology of psychiatric disorders, anxiety, anxiety disorders, major depression, molecular psychiatry, environmental exposure, functional neuroanatomy, (neuro)psychiatric (endo)phenotypes, animal models for psychiatric disorders, translational neuropsychiatry, the pathophysiology of mental disorders.

Research Master Cognitive and Clinical Neuroscience, specialisation Drug Development and Neuro Health  
PSY4823

Period 5

6 Apr 2020

5 Jun 2020

[Print course description](#)

ECTS credits:

0.0

Instruction language:

English

Coordinators:

- [G.R.L. Kenis](#)
- [D.L.A. van den Hove](#)

Teaching methods:

Assignment(s), Lecture(s), Paper(s), Presentation(s), Research, Skills, Training(s), Work in subgroups

Assessment methods:

Attendance, Final paper, Presentation

Keywords:

Western blot, stress, depression, Anxiety disorders, neurotrophic factors

Faculty of Psychology and Neuroscience

## **Electrophysiology: From Single Cell Activity to ‘Cognitive’ Markers**

### **Full course description**

Our brain is busy all the time, whether we are awake or asleep. There are thousands of neurons which are in constant communication with each other. Neurotransmitters and electrical currents convey information from one cell to another, which in turn produces electrical signals. This course is an introduction into the field of brain electricity. Students first learn about how currents develop (i.e., role of molecules, ion channels or membrane) and how they can be measured (e.g., patch clamp or single-cell recording). Next, discussions focus on how these currents are perceived in electrophysiology. Students also determine what the differences are in measurements using various species. For instance, can electrodes be placed in humans using the same approach that is used for rats? Finally, students will learn what these currents mean in terms of e.g., event-related potentials or (de)synchronisation measures. In addition to the theoretical basis, students will discuss some of the practical issues when performing electrophysiological recordings, such as measurement settings and electrode positions. This is accompanied by the presentation of pictures and short videos on how measurements in animals and humans are performed.

### **Course objectives**

Students:

- can explain neuronal electrochemical processes, patch clamp measurements and single-neuron recording techniques;
- can interpret event-related potentials from various species, EEG frequencies, event-related (de)synchronisation, and source localization;



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- can design electrophysiological studies with a link to (psycho)pharmacology;
- have basic understanding of how EEG is measured.

PSY4322

[Print course description](#)

ECTS credits:

4.0

Instruction language:

English

Coordinator:

- [T.W. Boonstra](#)

Teaching methods:

Lecture(s), PBL, Presentation(s)

Assessment methods:

Attendance, Participation, Presentation, Take home exam

Keywords:

electrophysiology, signal transduction, patch clamp, single-cell recording, electroencephalography, translational

Faculty of Psychology and Neuroscience

## Neuropsychopharmacology

### Full course description

This course addresses the influence of drugs upon normal functioning and on disease states. Neurobiological and neurochemical mechanisms are presented with the aim to deepen insight into the various mechanisms of drug action. The course will review major classes of drugs that are used frequently in the treatment of mental disorders and neurological disease, but also other classes of drugs that have side effects on the central nervous system. Other topics in this course are behavioural toxicology, experimental designs used in treatment studies, drugs of abuse and recreational drugs.

### Course objectives

Students will be able to understand neurobiology of drugs and mental disorders.

PSY4415

Period 6

8 Jun 2020

3 Jul 2020

[Print course description](#)

ECTS credits:

3.0

Instruction language:

English

Coordinator:

- [J.G. Ramaekers](#)

Research Master Cognitive and Clinical Neuroscience, specialisation Drug Development and Neuro

Health  
Teaching methods:

PBL

Assessment methods:

Attendance, Final paper, Presentation

Keywords:

drug action, psychopharmacology of CNS disorders, behavioural toxicity

Faculty of Psychology and Neuroscience

## Research Grant Writing Workshop

### Full course description

During this workshop students will learn why and how to apply for research grants. The need for acquiring funding for research, the opportunities for, and availability of grant application funding will be discussed. Several researchers who have experience in applying for different types of grants will provide students with first-hand knowledge and tips. Students will learn fundamentals of good grant writing, general preparation of the grant application and how to deal with reviewer comments. Ethical issues including feasibility and acceptability of the research, and the role of the local research ethics committee will be discussed. Students will subsequently choose a topic (from a list of topics) and work in teams to develop a research idea based on abstracts that will serve as a basis for writing a full research proposal during the second-year Research Grant Writing Course with guidance of a mentor (see description of PSY5112).

### Course objectives

- students will learn about the importance of grant writing for an academic career;
- students will recognize opportunities for funding, ethical aspects of grants, how grants can be acquired, and grant writing skills;
- students will develop a first outline of a grant proposal with peers.

PSY4112

Period 6

8 Jun 2020

3 Jul 2020

[Print course description](#)

ECTS credits:

1.0

Instruction language:

English

Coordinators:

- [S. Köhler](#)
- [R.L.H. Handels](#)

Teaching methods:

Assignment(s), Lecture(s), Work in subgroups

Assessment methods:

Attendance, Final paper

Keywords:

Funding possibilities, grant applications, proposal writing, team science

Second year courses

# Research Master Specialisation Drug Development & Neurohealth Year 2

Faculty of Psychology and Neuroscience

## Research Grant Writing Course

### Full course description

In this course, students will apply what they have learned during the Research Grant Writing Workshop (PSY4112) by going through a full grant proposal writing and review process. Students will work together (groups of max. 5-6 students) to write a research proposal on their selected topic, including an original research hypothesis, design, methods and valorization. Students are encouraged to think across boundaries of different scientific fields. A mentor (senior researcher) will guide students during this writing process. The students will write their proposal in 3 steps, and they will receive feedback from their mentor and peers. The resulting proposals will be reviewed by two assessors and presented during a symposium by way of an oral presentation.

### Course objectives

Students are able to:

- review literature;
- formulate a research hypothesis;
- design a research study;
- write a final research proposal;
- present and illustrate a research proposal at a symposium.

### Prerequisites

This course is a continuation of the Research Grant Writing Workshop (PSY4112).

PSY5112

Period 1

2 Sep 2019

25 Oct 2019

[Print course description](#)

ECTS credits:

3.0

Instruction language:

English

Coordinators:

- [S. Köhler](#)
- [R.L.H. Handels](#)

Teaching methods:

Work in subgroups

Assessment methods:

Research Master Cognitive and Clinical Neuroscience, specialisation Drug Development and Neuro Health  
Attendance, Final paper, Presentation

Keywords:

Research proposal, Interdisciplinary, hypothesis, design, methods, research symposium  
Faculty of Psychology and Neuroscience

## Applied Therapeutics

### Full course description

This course addresses prevalence of psychiatric disorders and the use of psychotropic drugs. The students will be presented pharmacotherapeutic data of several drugs, necessary to start a therapeutic regimen for individual patients. Clinical pharmacological knowledge will be applied to several cases within different drug groups, i.e. cardiac and CNS drugs, with the objective to maximize drug effects while minimizing side effects (i.e. movement, cardiovascular, sexual and CNS side effects). The influence of genetic polymorphisms and drug-drug interactions on patient dependent drug choice and treatment adherence.

### Course objectives

Students will be able to understand:

- the epidemiology of psychiatric diseases and CNS drugs in the general population;
- pharmacokinetic and pharmacodynamics properties of CNS drugs, including genetic polymorphisms;
- how to translate clinical pharmacological concepts into pharmacotherapy of psychiatric diseases.

PSY5812

Period 1

2 Sep 2019

25 Oct 2019

[Print course description](#)

ECTS credits:

3.0

Instruction language:

English

Coordinators:

- [J.G. Ramaekers](#)
- P.K.C. Janssen

Teaching methods:

PBL

Assessment methods:

Attendance, Final paper, Presentation

Keywords:

clinical pharmacology, pharmacotherapeutics

Faculty of Psychology and Neuroscience

# Behavioural Tests and Models

## Full course description

Neuroscience research involves the use of a wide variety of behavioural tests and models with laboratory animals. There are several criteria that neuroscientists can use to select behavioural tests and models. Eventually data has to be analysed, integrated and interpreted. How is this all done? Examples from mainly cognitive and affective tests and models are given. You will learn about these issues by analysing, interpreting and presenting data from experiments as well as from literature.

## Course objectives

Students will be able to understand:

- concepts of behavioural animal testing including validity;
- raw data management and analysis;
- interpretation of behavioural data.

PSY5332

Period 1

2 Sep 2019

25 Oct 2019

[Print course description](#)

ECTS credits:

1.0

Instruction language:

English

Coordinator:

- [J.H.H.J. Prickaerts](#)

Teaching methods:

Presentation(s), Work in subgroups, Skills, Paper(s)

Assessment methods:

Attendance, Final paper, Presentation

Keywords:

Test, model, in vivo, validity, translation