Graduate School of Medical Sciences of the University of Groningen at the University Medical Center Groningen.
www.rug.nl/research/gradschool-medical-sciences/

Publication
Graduate School of Medical Sciences PhD Study guide. June, 2018

Editors
Prof. Robbert Sanderman
Ms. Renate Kroese
The GSMS education committees

Fotografie
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Lay-out
Maarten Strik, Strik Design
Guided tour

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Mixed Models for Clustered Data

The aim of the course is to apply and understand mixed models for continuous, dichotomous and count outcomes in relation to explanatory variables for cross-sectional and longitudinal data. The course will cover modern statistical techniques for the analysis of non-normal data, e.g., members of the same family, patients within one hospital, repeated measures of individuals, etc. The course will provide knowledge on the concepts of linear mixed models and generalized linear mixed models for cross-sectional and longitudinal data for non-normal observations on variables.

The course will explain and practice with general estimating equation (GEE), maximum likelihood estimation (MLE), and restricted maximum likelihood estimation (REML).

Using many practical examples, the model specification, analysis and interpretation of the results will be explored in this course. In the accompanying workshops, the course participants can try out the possibilities of the software R using R-Studio.

KEY FACTS

- Intended for: PhD students, Research master students
- Examination: Participation required, a written assignment is optional
- EC: 1.5 (no exam)
- Language: English

Latest course schedule on: https://cursus1.webhosting.rug.nl/gsms/all-gsms-courses/

And, keep an eye on your portfolio in HoraFinita
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Research Data Management Awareness workshop
Managing your PhD
Introductory Event University of Groningen
GSMS PhD Development Conference

General Competences

Entrepreneurship and Valorization for medical sciences
Presentation skills
Publishing in English
Scientific Writing for biomedical/translational research
Science Writing for biomedical engineering
Science Writing Course in Health Research
BCN Management Competences in your PhD Project
BCN Orientation course
BCN Poster Presentation

Research Techniques

Critical Appraisal of Literature
Thesis Defence in Sight

BCN Introductory fMRI Course
BCN Advanced fMRI course
BCN Functional Neuroscience: EEG
BCN Matlab for neuroscientists
BCN Statistics Course
Advanced Clinical Epidemiology
Advances in genetic epidemiological research and data analysis
Applied Longitudinal Data analysis: modelling change over time
Basic Clinical Epidemiology
Clinical Relevance versus Statistical Significance
Epidemiology and Applied Statistics
Health Technology Assessment; Quality-of-Life and Patient-Reported
Outcome Measures (PROMs)
Incomplete Information: Non-response, Attrition, and Missing Data
Introduction to genetic epidemiological research and data analysis
Measuring Concepts in Quantitative Research
Medical Statistics
Mixed Models for Clustered Data
Multivariate Analyses: How to Handle Three Variables
Psychiatric Epidemiology
Study Design in Clinical Epidemiology
Systematic reviews and meta-analysis
Working with Questionnaires in Patient-related Research
Genomics data analysis for biologists
Image Analysis
Introduction into R
In vivo imaging using IVIS
Microscopy within Kolff
Phase II/III Clinical Trials
QCM - Quartz Crystal Microbalance
Surface Characterization
X-Ray Photoelectron Microscopy
SMBWO Immunology Course on HLA Typing and HLA Antibodies

Field Specific & Interdisciplinary Subjects

BCN Philosophy of Neuroscience
BCN Human Neuroanatomy
Advanced Drug Delivery & Drug Targeting ........................................................................65
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Organization

Registration

Every researcher doing doctoral research in one of the research institutes of the UMCG must be registered at the Graduate School of Medical Sciences (GSMS). New doctorate researchers (PhD students) are invited to register in Hora Finita: horafinita.nl/registratie/ Registration is mandatory. Being registered in Hora Finita makes you visible as a PhD student at the UMCG, giving you the opportunity to make use of GSMS support, like courses and activities in the graduate schools’ education program. Besides, Hora Finita is the perfect system to keep track of your activities and planning during your PhD research track, up to and including the application of the Defense Ceremony.

Hora Finita: some details

After the first registration, the GS office automatically receives a mail to check the data. The (co-) promotores receive an automatic mail requesting to add important data, like source of funding and research line. When all data have been entered and the (co-) promotores as well as the director of the GSMS have submitted their approvement, the PhD student can log in the system: horafinita.rug.nl with the RUG P-number and password.

It is important that the PhD student registers scientific activities and courses in Hora Finita (HF) regularly. The promotor must approve these activities in the student’s HF surroundings. The same goes for development and evaluation interviews and progress reports.

GSMS Course program

The Graduate School of Medical Sciences (GSMS) organizes all research master and PhD tracks within the University Medical Center Groningen (UMCG). Registered PhD students take the GSMS courses free of charge. The GSMS website contains an up-to-date list of all courses and online registration: https://cursus1.webhosting.rug.nl/gsms/all-gsms-courses/

Study requirements

The curriculum has a varied program, which gives all students working on a thesis the opportunity to join courses related to their research and circumstances. The GSMS curriculum is based on the European Credit Transfer System (ECTS). While carrying out the “standard” four-year research project, 30 credit points must be obtained by taking courses and research activities, as follows:

10 EC for courses
10 EC for research related activities (see list on next page)
10 EC free to choose for courses and research related activities.

As there are several categories of PhD students, the required number of credits varies accordingly:

<table>
<thead>
<tr>
<th>Duration</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>4 years</td>
<td>30 EC</td>
</tr>
<tr>
<td>4 years 80% appointment</td>
<td>22.5 EC</td>
</tr>
<tr>
<td>3 years</td>
<td>22.5 EC</td>
</tr>
<tr>
<td>2 years</td>
<td>15 EC</td>
</tr>
</tbody>
</table>

1 EC = 28 hours approx. (of contact time or working hours on a subject)

The GSMS Education Committee is responsible for assigning the EC.

ECTS credits can be obtained by:

- Taking courses in the GSMS education program
- Taking courses at other institutes and organizations
- Taking Research Master’s program courses
- Conducting research activities.

EC for research related and academic activities

In addition to taking courses, the GSMS stimulates PhD students to familiarize with activities related to the transfer of knowledge, such as keeping up with professional literature, participation in work discussion meetings and reference meetings of the student’s own research group and - in consultation with their supervisor - of other research
groups, active participation in local and national scientific meetings, and in international meetings.

The table below describes how several activities are rewarded. Please note that it shows a lot of opportunities for PhD students to get rewarded with credits beyond the regular course work.

### EC for research related and academic activities

<table>
<thead>
<tr>
<th>Research related activities</th>
<th>Credits</th>
<th>Max</th>
<th>Remarks</th>
</tr>
</thead>
<tbody>
<tr>
<td>Workshops/Master classes/Summer schools</td>
<td></td>
<td></td>
<td>Depending on time and literature (28 hrs per EC)</td>
</tr>
<tr>
<td>Annual PhD meeting Research Institutes</td>
<td>0.25/annual meeting</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Seminars / Journal clubs</td>
<td>0.1/seminar</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attending conferences, symposia</td>
<td></td>
<td>2 EC</td>
<td>Depending on time invested (28 hrs per EC)</td>
</tr>
<tr>
<td>Attending the annual PhD day RUG</td>
<td>1 EC/PhD day</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attending the bi-annual PhD conference GSMS</td>
<td>1 EC/Phd conference</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Presenting data at international conferences (orally and poster)</td>
<td>0.5/conf</td>
<td>6 EC</td>
<td></td>
</tr>
<tr>
<td>Invited lecture outside institute</td>
<td>0.5/conf</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Prize for best abstract/poster/presentation</td>
<td>0.5/prize</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Granted project proposal – 1st author:</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>&lt; 10,000 Euro</td>
<td>0.5 EC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10,000 –&lt; 30,000 Euro</td>
<td>1 EC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>&gt; 30,000 Euro</td>
<td>2 EC</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Supervised reviewing of manuscripts (2)</td>
<td>1 EC for 2 manuscripts</td>
<td>3 EC</td>
<td></td>
</tr>
<tr>
<td>Research stay abroad (minimum 2 weeks)</td>
<td></td>
<td>4 EC</td>
<td>Depending on time invested (28 hrs per EC)</td>
</tr>
<tr>
<td>Stay in Dutch lab</td>
<td></td>
<td>4 EC</td>
<td>Is granted only in very special occasions. Prior to the visit to the Dutch lab, the supervisor and PhD student must - with arguments - appeal for granting with the PhD education committee of the Research institute.</td>
</tr>
</tbody>
</table>

### Teaching/Student supervision

- Tutor/mentor: Depending on time invested (4 EC)
- Lecture: Depending on time invested (6 EC)
- Coach master or bachelor scientific thesis: According to Institute for Medical Education Multiplier Medical Sciences

### Definitions:
- Maximum EC for full time 4 years PhD students, 3 and 2 years students accordingly less
- Teaching can be for medical as well as other students at university level

### Extra EC are awarded to the following items:
- Member of an Education Committee (Institute or GSMS): 1 EC/yr.
- Member of the organization of the RUG PhD day: 6 EC for core members, 3 for other members and volunteers.
- Member of the organization of the GSMS PhD conference: 4 EC, 2 for volunteers.
- Participation in the GSMS PhD Development Conference: 1 EC.
- Participation in the RUG PhD day: 1 EC.

### Obligatory courses

- Scientific Integrity
- Research Data Management Awareness workshop
- Managing your PhD

Although all PhD students have the opportunity to join courses related to their own circumstances, the GSMS organizes three courses obligatory for all PhD students, to be taken in the first year of their PhD research track.

### Obligatory events

- Introductory Event University of Groningen
- GSMS PhD Development Conference.

Further information on these courses is given on page 24.
Financial Support

The GSMS supplies a maximum of € 600 per calendar year for participating in external courses, and another € 600 for attending conferences. Every registered PhD student can apply for reimbursement of (part of the) costs on an annual basis (calendar year).

Groningen Research Institute for Pharmacy (GRIP)

GRIP PhD students are registered in the Graduate School of Science and Engineering (GSSE). However, because of collaboration agreements, they must also be registered in the GSMS, to make use of all facilities, education and financial support of the GSMS. That is why the GSSE ITB (Individual Training Budget) is NOT applicable for GRIP PhD students. Ask the GSMS education assistants how to act in case you want to join a GSSE course. See contact persons on page 87.

Printing costs of the dissertation

All PhD students at the UMCG receive a financial contribution from the UMCG of € 250. Additional to this, students registered at the Graduate School of Medical Sciences may receive a financial contribution to a maximum amount of € 850 if meeting the criteria on:

1. speed
2. quality
3. education

Each criterion renders € 200.

Information and application form:
Henriëtte Niewold, h.niewold@umcg.nl

GRIP PhD students must apply for financial support of the printing costs at the GSSE. Detailed information can be found at: myuniversity.rug.nl/infonet/medewerkers/fse/gradschoolscience/

The GS office

The GS office is situated on the 7th floor of “De Brug”. Everyone is welcome for information and support on courses, finances support, Hora Finita and international matters.

Director of the GSMS is M.J. Smit, PhD.
Executive secretary: Mathilde Pekelaer: m.t.l.pekelaer@umcg.nl
GS office secretary staff: Paulien de Haan, p.de.haan01@umcg.nl, Evelyn Kuiper, e.t.kuiper-drenth@umcg.nl

The PhD education program offers a wide range of courses for the additional training of PhD students. The GSMS has an online course registration system where you can pick and choose the courses you need: https://cursus1.webhosting.rug.nl/gsms/all-gsms-courses/

And, of course, the PhD education assistants can provide all necessary information (see next page and page 90 for detailed information).

PhD education assistants: Maaie Bansema, Diana Koopmans, Renate Kroese.
PhD coordinator: Kiki Koster.

As member of the GSMS Management Team, Prof. Robbert Sanderman is responsible for PhD education and policy.

The Research Master office is located on the 2nd floor of ‘De Brug’. The research master programs Clinical and Psychosocial Epidemiology (CPE) and Medical and Pharmaceutical Drug Innovation (MPDI) have its own study guides, with detailed information on the programs.

Team lead Research Masters Program: Meike van der Veen.

Internationalization coordinator: Joyce Fongers.
Communication officer: Judith Barthel.

The teams collaborate closely with the Research Office, which is also situated on the 7th floor of ‘De Brug’. The Research Office is involved in the development of the UMCG Research Policy, providing support to the UMCG Research community, thus covering all research and researchers involved in the Research Institutes BCN, CRCG, GUIDE, Kolff and SHARE.

Besides the GS office there are several committees supporting both staff and PhD students.

PhD council

The PhD council consists of 8 PhD students, covering the 5 research institutes and taking care of PhD student matters in the GSMS. The council organizes monthly activities, ranging from scientific lectures to social get togethers.

Contact: phdcouncilgsms@gmail.com

The council has created a wiki page with information about all aspects of life as a PhD student in the GSMS: gmsphdwiki.webhosting.rug.nl/Home

GSMS Education Committee

The education committee decides on all matters concerning GSMS and external courses, like course assessment, EC assignment, etc. in the course program, assessing the courses on a regular basis and discussing new courses. Contact person: Renate Kroese, r.c.kroese@umcg.nl

Each institute has its own education committee, the chairs are member of the overall GSMS education committee, accompanied by one or two PhD students’ representatives. The institutes also have their own PhD council.
Confidentiality advisors

Both the GSMS and the Research Office have a confidentiality advisor for PhD students who experience undesirable conduct, unequal treatment or problems in cooperation at work.

GSMS: Kiki Koster, k.e.koster@umcg.nl
Research office: Michiel Hooiveld, m.h.w.hooiveld@umcg.nl

Internationalization

Almost 50% of the GSMS PhD students comes from outside The Netherlands. The GS office has an internationalization coordinator who mediates between interested PhD students abroad and research staff at the UMCG. The GSMS has developed an internationalization strategy that is based on the establishment of sustainable collaborations with high-quality partners abroad.

Together with the staff assistants, the coordinator takes care of preparations for PhD candidates to come to The Netherlands. Having a communication officer join in to provide all relevant information as well, makes the GSMS very well suited for international students and education programs.

The GSMS staff assistants provide detailed information on a variety of subjects, such as health matters, visas, registration with the municipality, driver’s licences, university facilities, daily life in Groningen, etc.

Further information: Mathilde Pekelaer: m.t.l.pekelaer@umcg.nl

PhD communities

GRIN
Groningen Graduate Interest Network, which represents and supports the interests and rights of all PhD students at the University of Groningen: www.gringroningen.com

GOPHER
Groningen Organization for PhD Education and Recreation, which organizes informative and social events: www.gophergroningen.com

PNN
The PhD candidates Network of the Netherlands is the national organization that represents the interests of PhD candidates who work at one of the 14 Dutch universities, at one of the 8 University Medical Centers or, at one of the 5 research centers.

The main objective of PNN is to safeguard the interests of all PhD candidates, regardless of whether they are employed at a Dutch University, a University Medical Center, or otherwise engaged with PhD research.

In case you have any issues that are of interest for all PhDs, contact your PhD council, they have regular contact with PNN: www.hetpnn.nl/

UMC Workforce

The UMC Workforce is a committee of PhD candidates Network of the Netherlands (PNN). It was established in 2015. The workforce represents all UMC PhD candidates from the eight UMCs in the Netherlands. Two PhD candidates are involved from every UMC.

The UMC workforce acts as a speaking partner and advisory body for national stakeholders. An example is the Ministry of Health and the Federation of Medical specialists. In addition, we try to jointly address issues that apply to the Dutch UMCs and which benefit from cooperation at national level. An example is the duration of contracts. There are many differences between universities and it is not always organized the way it should be. Last but not least, the workforce is a place to exchange experiences and issues that are relevant for all eight UMCs.

In case you have any issues that are of interest for all PhDs, contact your PhD council, they have regular contact with PNN and the UMC workforce and have the ability to address issues at national level.

The PhD Scholarship Program

In the PhD Scholarship Program, selected prospective PhD students are invited to write their own PhD research proposal in collaboration with an expert PhD supervisor with whom they would like to work. Thus, a PhD scholarship student will do curiosity-driven research that gives the opportunity to work at the boundaries of knowledge.

The GSMS has different tracks within the PhD scholarship program:

• a 4-year trajectory in which PhD students bring their own scholarship,
• a 3-year trajectory after graduation from excellent (Research) Masters,
• a 2-year trajectory for Dutch medical students doing PhD research (MD/PhD-students),
• a 2-year trajectory for PhD students with a so-called Sandwich Scholarship (two years at the home university and the last two years at the UMCG).

These PhD students have signed a UMCG agreement to receive a scholarship during the length of the PhD research. This means that they are a student, not an employee.

Career Perspectives Series

The Career Perspectives Series (CPS) was developed by the Groningen Graduate Schools to enable PhD students to think about their future career steps and prepare for that moment after they have received their PhD degree. By enrolling in CPS courses and workshops during your studies, you can develop your talents and skills beyond research and discover the various career possibilities awaiting you after your PhD.
• What transferrable skills can I develop now for a future career inside or outside academia?
• How can I apply these skills in my professional career?
• What job opportunities are possible for PhD graduates?

The courses and workshops within the Career Perspectives Series focus on three main areas:
• Information and Awareness.
• How do I get started in Academia?
• How do I get started in a Non-Academic career?

Further information: www.rug.nl/phd-cps

Guidelines and Requirements for Approval of a PhD Thesis

In the following the general quality/quantity requirements for a PhD thesis at the UMCG are given, using three questions/answers:

Question 1: Who decides whether a manuscript of a PhD thesis fulfils the requirements for a PhD degree at the UMCG/RUG?

Answer: The Principles of Scientific Integrity (see page 24) give a detailed description on the procedure for approval. In short, the first judgment of the quality of the work done by a PhD student (promovendus) as reflected in the manuscript of the PhD thesis - i.e. whether he/she qualifies to be admitted to the thesis defence, or not, - is done by the supervisors (the promoters, who have the ‘ius promovendi’). They indicate their approval in Hora Finita, submit the manuscript to the Dean and propose the Dean to start the procedure. The Dean appoints a ‘reading committee’, generally consisting of three professors of whom at least one must have an appointment outside the University of Groningen. The members of the ‘reading committee’ (assessment committee) judge the quality of the manuscript independently, and advise the Dean. The Dean decides.

Question 2: Are there minimum requirements, e.g. regarding the number of experimental and published chapters, or the size of a thesis?

Answer: The protocol given above does not mention an obligation to have (parts of) the thesis published and/or submitted/accepted for publication prior to the thesis defence. However, as said before, in principle there is no absolute requirement for publication to be admitted to the thesis defence, nor for obtaining the PhD degree. A PhD student must finish the manuscript of the thesis within the allotted time period. It is important that a well-written, summarizing discussion should show that the candidate has mastered his/her field of research and is capable of independent, scientific reasoning.

Question 3: Is there a general guidance regarding the quality of the scientific journals in which articles should be published?

Answer: It is important to strive for publication in high-ranked journals. This also holds for the publications that are included in a thesis. It is better to include experimental data that cannot be published in a high ranked journal in a chapter of the thesis than to publish these in a low ranked journal. To encourage publication in high ranked journals, the Graduate School of Medical Sciences offers financial support in printing costs as an incentive for quality, when at least two of the articles in the manuscript have been published or accepted for publication in the top 25% of the relevant ISI-field in Web of Science. Moreover, the manuscript of a thesis which contains publications in high-ranked journals and which is regarded as being in the quality top 5-10% of these can be taken as the basis for a ‘cum laude’ application. The procedure for a cum laude application is given in the protocol for the conferal of a PhD as mentioned above. A ‘cum laude’ PhD defence is not a prerequisite, but may be very helpful in starting a scientific career, e.g. as (pre)tenure track fellow at the UMCG.

SMBWO certificates

The Foundation for Biomedical Scientific Research Training (“SMBWO”) is the organization which co-ordinates postdoctoral research training of biomedical scientific investigators in the Netherlands. In general, postdoctoral research training, including the academic PhD training, occurs within the Dutch universities, in part under the auspices of the respective scientific occupational “Societies” bundled in the “Federa” (the Dutch Federation of Biomedical Scientific Societies, “FMWV”) and the Society for Biomedical Scientific Investigators (“VMWO”). Since uniform criteria for postdoctoral research training are lacking, the mission of the SMBWO is to provide a safeguard for the quality of these training programmes. One aspect of this quality control relates to the implementation of unified requirements for certification and ultimately to formal recognition of the SMBWO postdoctoral research training programmes by the Dutch government. Within the programme of the GSMS courses, several courses can be used as part of the SMBWO education plan. This is indicated at the different courses.

At this moment, training for SMBWO certifications at the UMCG are available for the fields mentioned below. An SMBWO training programme can be organized under supervision of the assigned UMCG supervisors. For the SMBWO certificates of Parasitology and Food Sciences no training programmes are available at the UMCG.
Field UMCG supervisor email
Epidemiology (B) Prof. G.H. de Bock g.h.de.bock@umcg.nl
Immunology Prof. F.G.M. Kroese f.g.m.kroese@umcg.nl
Medical Microbiology Prof. A.W. Friedrich alex.friedrich@umcg.nl

More information about the SMBWO certificates can be found at www.SMBWO.nl or from the chair of the SMBWO: Prof. dr. N.A. Bos, n.a.bos@umcg.nl
GSMS Courses

Obligatory courses and events
Ethics of Research and Scientific Integrity for Researchers.

Researchers have developed professional standards designed to enhance the progress of science and to avoid or minimize the difficulties of research. These standards more and more become expressed in formal codes that address issues of interpersonal, professional, institutional, and public responsibility. Researchers have an obligation towards their fellow researchers in providing accurate and reliable research; they owe themselves adherence to professional standards to build personal integrity in a research career; they may expect an environment in which research can be conducted in an ethically sound way; finally, researchers have an obligation to act in ways that serve the public.

These high moral standards play a role in all phases of research, from research problem selection, methodology, working with research subjects to issues of international collaboration, commercialization and authorship. The course is designed as an interactive course training the participants to recognize ethical issues in their daily work and discussing opportunities to deal with these. This means that institutional and other tools will be discussed such as the role and functions of Institutional Review Boards, the UMCG protocol and risk-benefit assessments. Topics can range from authorship, fabrication and falsification, mentoring, ethical questions in clinical research, managing research misconduct, tainted data, to ghostwriting, peer review, retraction.

LEARNING OUTCOMES

• Deepen the understanding of and reflection on the problems and tools of research ethics.

COORDINATOR

E.L.M. (Els) Maeckelberghe, PhD

Research Data Management Awareness workshop

The goal of this workshop is to create awareness about research data and good data management. It will give an introduction to the meaning and importance of research data management. Moreover, it will outline the importance of a data management plan, how to make one and where you can get help.

The workshop will consist of two parts. In the first part, the theory and principles on research data management will be discussed. During the second part of the workshop, the four steps in the UMCG data management plan will be discussed. You will be asked to think of and provide possible answers and solutions for each step.
Managing your PhD

The essential elements are:
- Working within a project structure
- The ‘interplay of forces’ surrounding a project
- Timetabling
- Decision-making
- Managing a project
- Writing a project assignment
- Organizational cultures
- Project-friendly cultures
- Consultation interview
- The phase model of research projects

The participants will not only become familiar with the theory, but will also practice useful skills by means of assignments and exercises.

The course takes one day. This first day is the start of coaching and follow-up sessions after 3 months, 1 and 2 years.

The main topic of these follow-up sessions is the progress of your research project. The sessions last about 3 hours. Note that the follow-ups are compulsory and are especially aimed at preparing the students for completing their thesis within the limited time span of their research period.

- Be able to identify the processes around you that influence your work, and to identify those processes that interfere with progress and which should be eliminated.
- Learn about phasing of (complicated) research and managing project progress by using phasing tools.

Prof. G. (Ingrid) Molema
Entrepreneurship and Valorization for medical sciences

The central theme of the Course is entrepreneurship as a process of exploring, evaluating and exploiting opportunities for valorization of knowledge that has been developed at the University through, for example (but not only), technology venturing.

In seven classes/workshops we will discuss individual characteristics of entrepreneurs (How can a scientist become a successful entrepreneur?), the origin of entrepreneurial opportunities (How to spot an opportunity to create a business?), basic principles of business models, including strategy, marketing, network organization and financing aspects of launching a business.

Each class will be based on a pre-class reading, a discussion in class on the main topic of the week and a group work assignment to apply the knowledge and see how it can be used. Finally, we aim to finish each class with a guest talk by an entrepreneur. In some cases entrepreneurs will give the group work assignments based on their business practice.

At the end of the course (Week 8) students of this course will develop and present a business case based on their own (PhD) research project, or on analysis of another business (preferably in medical area). Depending on the specific research subject (e.g. technical or not) this business case might be written in the form of a Technology Foundation STW Valorisation Grant Phase II Application.

O. (Olga) Belousova, PhD
Prof. A. (Aard) Groen

Coordinator: O. (Olga) Belousova, PhD

LEARNING OUTCOMES
• Be aware of the basic concepts and theories of entrepreneurship and valorization.
• Be able to critically review these theories and discuss their assumptions.
• Be able to apply insights on entrepreneurship in contexts related to medical & life sciences research.
• Develop an entrepreneurial attitude, a minimal requirement necessary for researchers these days.

O. (Olga) Belousova, PhD  *
Prof. A. (Aard) Groen  *
* Faculty of Economics and Business

Presentation skills

This course, which consists of an input session and two practice sessions, helps presenters become aware of their strengths and weaknesses and aids them in improving any deficiencies by watching, analyzing and giving presentations. The opening session helps to create awareness in all the necessary aspects of preparing, structuring and delivering an effective academic PowerPoint presentation in English. In the practice sessions, every participant will deliver a 15-minute presentation in English and receive feedback from the instructor and group members (the audience), and have the opportunity to watch and reflect on their performance in a streamed video of their presentation.

COORDINATOR
Language Center RUG

LEARNING OUTCOMES
• Increased awareness of conventions of academic presentations in English
• Increased self-confidence
• Improved presentation skills
• Improved proficiency in English

Publishing in English

This course covers all aspects of writing biomedical and technical publications in English. The course will examine the various conventions of biomedical/technical writing, including layout of a paper, organization of each section, and vocabulary. Attention will be given to construction of paragraphs and style expectations in sentence structure and linkage. Particular points of grammar and spelling will be covered according to the needs of the students.

The central focus of the course will be to work on your own writing project, such as a research publication, review, or thesis. During the course, students will be asked to submit several pieces of text from this project, each about 750 words. Detailed, individual comments will be given on this text. A course manual will be provided, and extensive supplementary materials and exercises are available on Nestor.

Participants should set aside at least 3 hours per week for homework. The lecturer will use these texts to illustrate common mistakes.

COORDINATOR
Language Center RUG

LEARNING OUTCOMES
• Level of proficiency in writing in English approaching C2
• Increased awareness of stylistic and editorial conventions of the field.
Scientific Writing for biomedical/translational research

Content Scientific Writing A-Z is a one-week, full-time writing course designed for 3rd and 4th year PhD students who already have scientific writing experience. The course focuses on developing and refining writing skills relevant to preparing research manuscripts in the field of biomedical sciences. The course is intensive, interactive, and gives attention to general scientific writing strategies as well as to in-depth writing instructions.

This course provides:

- Flash exercises; these are short exercises that will help you memorize and practice lecture information.
- Workshops; you will work individually or in small groups on your own manuscript, putting into practice what you have learned in theory.
- Demonstrations; examples drawn from your own manuscripts will be discussed and improved on site.
- Personal reflection and exchange breaks.

- Have a clear understanding of the process leading to and following upon writing a biomedical research manuscript. In overview, the main steps of this process are: 1) thinking about and planning your research; 2) performing experiments; 3) writing the manuscript; 4) submitting the manuscript; 5) dealing with rebuttals and post-publication issues. Your take-home message will be that correct execution of all steps leads to successful publication of your scientific work.
- Be able to (re)write your research manuscript critically, at the level of word, sentence, paragraph, section and whole manuscript. Style and argumentation skills will both receive attention.
- Learn about the role of your own personality in the writing process. You will become aware of your positive and negative convictions and (de)motivations and will learn to address them in order to improve your scientific self-confidence, satisfaction and success.
- Have improved your own research manuscript and, hopefully, come a step closer to submission.

E.R. (Eliane) Popa, PhD

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Science Writing for biomedical research

Preparation for the course:
You can participate as an individual student or form a group of maximally 3 students. In preparation of the course, each group has to write a manuscript on their ongoing scientific research.

You will benefit most from the course, if you choose to write the manuscript on a topic that is close to being written down in a manuscript that you will have to prepare anyway.

It is strongly advised to write the entire manuscript in the weeks preceding the course and not during the course, as during the course you will be very busy with modifying the manuscript.

Guidelines for initial manuscript preparation:
Your manuscript will have to consist of:
1. Title page, including: title, authors and their affiliation, name of corresponding author and key-words.
2. Abstract
3. Introduction
4. Materials and Methods (sub-division is allowed)
5. Results
6. Discussion
7. Conclusions
8. Acknowledgements
9. References
10. Supplementary materials (if you consider this necessary)

There are no word limits and you may use as many figures, tables and references as you consider necessary. More specific instructions on manuscript style will develop during the course.

Set-up of the course:
During the course, lectures will be given on writing scientific manuscripts in general and the specific sections of a manuscript. After each lecture, you will have to work alone or with your other group members to modify your manuscript according to the content of the lecture given that day. The teacher will be present during course hours for initial modification of your manuscript to give individual help. Although each lecture will deal with specific sections of a scientific manuscript, it is advised that you finish your first draft of entire manuscript according to the guidelines provided above and according to your own personal style before the course starts.
You should not forget to bring your laptop. Modification of the manuscript may take more time and if necessary you will have to continue modifying the next day. At the end of the entire course you should have a manuscript that should be finished to a state close to submission to a journal. Total time involved for the students will be 2-3 weeks.

This course is aimed to teach the basic principles of science writing, without compromising the development of your own style of writing. Emphasis is on writing for engineering style journals although ample attention will also be given to biofilm related journals as well as journals dealing with nanotechnology.

The course is not an English writing course and basic knowledge of the English language will help you benefit from the course.

### Course schedule (total time frame 2 months max)

<table>
<thead>
<tr>
<th>Lecture</th>
<th>Time</th>
<th>Topic</th>
</tr>
</thead>
</table>
| 1       | 2h   | 1. Set-up of the course  
2. How to write a world-class paper?  
3. The abstract |
| 2       | 2h   | 3. Title page, abstract and introduction  
Check: is your manuscript still an entity? |
| 3       | 2h   | 4. Materials and Methods  
Supplementary material  
Check: is your manuscript still an entity? |
| 4       | 2h   | 5. Results-tables and figures  
Supplementary material  
Check: is your manuscript still an entity? |
| 5       | 2h   | 6. Discussion  
Check: is your manuscript still an entity? |
| 6       | 2h   | 7. Miscellaneous checkpoints:  
Check: is your manuscript still an entity? |
| 7       | 2h   | 8. Deviations from regular manuscript writing,  
cover letters, and dealing with reviewer comments  
Make manuscript adjustments, write a cover letter |
| 8       | 2h   | 9. Ethical issues in science writing:  
Plagiarism, data manipulation, co-authorship or acknowledgement, conflicts of interest  
Feedback on the course content by participants |

T.G. (Theo) van Kooten, PhD

### Science Writing Course in Health Research

**CONTENT**  

The goal of the course is to improve the quality of scientific writing of quantitative research in health research. Various topics will be discussed during the interactive lectures. During the interactive lectures the students will be provided with (parts of) draft manuscripts and are asked to furnish the manuscript with an abstract, title or keywords. Further, data will be given and students will be asked to construct a table or a figure.

The coach groups will consist of 4 to 5 students and a coach. The students will send (parts) of concept manuscripts to the coach and other students one week prior to the next meeting. The coach and students of the coach groups will provide the student with feedback about concept manuscripts. Feedback will be given verbally.

### LEARNING OUTCOMES

- To write a structured manuscript (IMRaD)
- To write a proper introduction, method, results, discussion
- To deal with comments of reviewers
- To cooperate with co-authors
- To write a catchy title and abstract
- To cope with editors’ requests and reviewers’ comments

**COORDINATOR**  

Prof. P.U. (Pieter) Dijkstra

### BCN Management Competences in your PhD Project  
*(Compulsory for BCN)*

**CONTENT**

**Part 1: Transferable skills**

**Part 2: The essential elements of working within a project structure:**
- Project assignment
- The ‘interplay of forces’ surrounding a project
- Timetabling
- Decision-making
- Managing a project
- Writing a project assignment
- Organizational cultures
- Project-friendly cultures
- Consultation interview
- The phase model of research projects

The participants will not only become familiar with the theory, but will also practice useful skills by means of assignments and exercises. The follow ups are especially aimed at
preparing the PhD students for completing their thesis within the limited time span of their research period.

BCN PhD students in the first six months of their appointment will receive an invitation for Part 1 of the course. Part 2 will be planned 9 months later.

- Learn to work within a project structure as an effective method of scientific research that should result in a doctoral dissertation. A very important course for those who want to be successful as a PhD student.

Prof. F.W. (Frans) Cornelissen, PhD

BCN Orientation course
(Compulsory for BCN)

This course will provide general background information for non-specialists concerning major research themes within BCN. The aim of the course is to facilitate multidisciplinary exchange of information and ideas within BCN and to become familiar with the various groups and their scientific ideas and techniques, with the explicit purpose to stimulate multidisciplinary approaches. A broad overview of research possibilities enables collaboration in unforeseen directions.

The theme of the course: The behavioural and cognitive neurosciences as they are represented in the University of Groningen. The course includes presentations of the main scientific questions and the major research techniques that are applied within the research school BCN.

Preliminary Themes:
- Learning and memory
- Emotion
- Perceptual pathways towards cognition
- De- and regeneration in the brain
- Cognitive psychology and psychophysiology
- Energy

- To provide general background information for non-specialists concerning major research themes within BCN
- To facilitate multidisciplinary exchange of information and ideas within BCN
- To become familiar with the various groups and their scientific ideas and techniques, with the explicit purpose to stimulate multidisciplinary approaches. A broad overview of research possibilities enables collaboration in unforeseen directions.

Prof. E.A.(Eddy) van der Zee

BCN Poster Presentation

All PhD students will be invited to make a poster about their research and to present it in a small group of fellow PhD students, with one senior BCN researcher functioning as a supervisor, during the BCN Winter Meeting. Within this group you are also expected to ask questions about posters of other participants. Participation without a poster is also possible.

Objectives:
- Practicing a poster presentation of scientific research findings and plans to a broad audience
- Providing an overview of current BCN research.
- Present your research visually in a clear and self-explanatory way
- Explain your research to fellow PhD students and senior scientists, both inside and outside your field
- Answer questions about your research in a clear and concise way
- Screen, understand and ask questions about posters of other researchers.

Prof. R.A. (Robert) Schoevers

Critical Appraisal of Literature

This course is intended primarily for PhD students beginning their PhD training. The aim of this course is to teach PhD students to assess critically quality and content of research papers.

The course consists of 7 sessions of 2-3 hours in which research designs are critically evaluated. For each meeting, the student will prepare 2 papers – provided by the lecturer in advance – by critically reading and assessing them. During each session the students will discuss their assessment of the papers in small groups. Finally, a group discussion will be held about the quality of the paper and the assessment of criteria.

Participate successfully in journal discussions in their own research group
- Critical assessment of the research papers in the fields described and able to detect flaws in those papers.

Prof. P.U. (Pieter) Dijkstra
Thesis Defence in Sight

At least twice a year, SHARE organizes a meeting with fellow SHARE-PhD students who will be defending their thesis within six to eight months.

We discuss such matters as:
- Rules and regulation
- Habits
- How to handle comments by the reading committee
- How to plan the ‘event’
- SHARE requirements
- Costs and possibilities for funding of the thesis printing costs.

D.G. (Truus) van Ittersum
GSMS Courses

Research Techniques
BCN Introductory fMRI Course
“From Voxels To Networks”

The BCN-NIC introductory fMRI course is hands-on, and gives the participants an introduction to all aspects of a real fMRI experiment. The course provides insights into the basics of the MR technique and MR safety, the physiology underlying the fMRI BOLD signal, paradigm design, stimulus presentation, data handling and statistical analysis. Participants work in small groups on a self-chosen topic, design and carry out a small fMRI experiment, analyze the data and present the results to their fellow course members.

Learning Outcomes
- How to set up and acquire a fMRI experiment
- Execute and master fMRI analysis
- Present results and statistics

Coordinator
R. (Remco) Renken, PhD

BCN Advanced fMRI course
“From Voxels To Networks”

The course is primarily intended for researchers who employ ‘conventional’ regression approaches to detect brain activation with fMRI (e.g. SPM), but who would like to learn more about the application of other related and upcoming techniques.

Examples of topics that will be discussed are network analysis, permutation testing and bootstrapping techniques statistics (e.g., Bayes, 2nd level).

Learning Outcomes
- Knowledge about strategies in advanced analysis of fMRI and related structural MRI data
- Improved understanding of methods in fMRI analysis

Coordinator
R. (Remco) Renken, PhD

BCN Functional Neuroscience: EEG

Besides treating theoretical backgrounds, participants will become acquainted with EEG hard- and software. Additionally, the course consists of an introduction into Brain Vision Analyzer, which will allow all students to analyze the EEG data they recorded on the previous days.

Topics for the EEG part of the course are:
- EEG backgrounds, EEG recording and EEG analysis techniques
- Clinical applications of EEG
- Setting-up an ERP experiment
- Executing an ERP experiment
- Getting acquainted with the EEG-lab at the BCN-Neuro Imaging Center and executing first recordings
- Getting acquainted with Brain Vision Analyzer software (EEG analysis) and analysis of data recorded on previous days.

Learning Outcomes
- Basic understanding of theoretical concepts underlying EEG recordings
- Acquainted with EEG hard- and software
- Able to analyze EEG data using Brain Vision Analyzer (EEG).

Coordinator
Prof. M.M. (Monicque) Lorist

BCN Matlab for neuroscientists

Is being developed. More information will be on our course registration website: https://cursus1.webhosting.rug.nl/gsms/all-gsms-courses/

Coordinator
R. (Remco) Renken, PhD

BCN Statistics Course

This course provides an overview of several statistical concepts and methods. The software used in this course is R, which is freely available and provides excellent facilities for sophisticated statistical analyses. The topics treated in this course are: data exploration (basic visualization), t-tests, ANOVA, non-parametric tests, regression analysis, logistic regression analysis, mixed-effects regression analysis (for repeated measures), and generalized additive modelling (for time series analysis).

Coordinator
R. (Remco) Renken, PhD
The objectives of this course are to refresh and augment your statistical knowledge. The course provides you with an overview of the relevant aspects in using statistics. The course will be relatively hands-on, meaning that the focus of the course lies on determining which test to use, how to use it, and how to interpret the results.

Given that the teacher of the course is a linguist, the examples used in this course will focus on linguistic material. However, it is straightforward to apply them to data from your own field.

Furthermore, feel free to bring your own data to get feedback about which type of analysis you could use.

- After the course, you are able to select an appropriate statistical method for the most frequent occurring data analytic problems in the cognitive and behavioural sciences.

M.B. (Martijn) Wieling, PhD

**Advanced Clinical Epidemiology**

In recent years, the empirical approach in clinical research has become increasingly important. Most PhD students combine patient care with clinical research. Clinical epidemiology, which is empirical and patient oriented, is most suited for such a combination. Training in study design and analysis provides a sound basis for successful clinical research. The course basic Clinical epidemiology forms the basics of this advanced course.

**Prerequisite**

Basic Clinical Epidemiology or Epidemiology and Applied Statistics OR some experience in clinical epidemiology and SPSS.

**Literature**

- Background literature that will be available from Nestor.

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

- Perform a diagnostic study, to recognize bias and to evaluate a simple decision trees
- Know the principles of prognostic modelling, to apply these and to construct a risk score and to recognize bias
- Explain fundamentals of observational studies

**COORDINATOR**

M.B. (Martijn) Wieling, PhD
Applied Longitudinal Data analysis: modelling change over time

This course focuses on the analysis of longitudinal data with continuous outcome variables. Step by step, we will be developing longitudinal data analysis techniques by extending the well-known multiple linear regression model for studies with repeated observations on the same respondents. This will result in the presentation of the mixed effects model (also known as multilevel model, random-effects model, hierarchical linear model, ...), allowing the analysis of change over time (such as change of test-scores over time, growth of any kind).

Throughout the course lectures, the emphasis will be on understanding the why and how of these models by explaining the underlying theory of these multilevel analyses using lots of examples. The application and interpretation of outcome of these techniques will be demonstrated in SPSS. The lectures will follow topics and theory along the lines of the first half of the book Applied Longitudinal Data Analysis by J.D. Singer and J.B. Willet.

In the computer practicals, students will analyse data from example datasets using SPSS. In the book and online material which accompany this course, scripts and data for these examples can also be found for other software packages, such as R, SAS and Stata (and in lesser extent: for HLM, MLwiN and Mplus).

Students entering this course should have knowledge of and experience in using basic statistical concepts and techniques, including multiple linear regression analysis and analysis of variance. This basic knowledge is provided by the Basic Medical Statistics course. For more in-depth model building (and techniques for non-continuous outcome variables), the use of Generalized Linear Mixed models and GEE, see also the course Mixed Models.

**Requirements**

Basic Medical Statistics (or an equivalent course, see above)

- Explore (graphically and numerically) longitudinal data and recognise the need for mixed effects models (multilevel models)
- Understand the theory behind the multilevel model for change
- Build, examine, interpret, expand and compare mixed effects models
- Perform all described techniques using SPSS (or other major statistical software packages, see above)

S. (Sacha) la Bastide-van Gemert, PhD
C.H. (Christine) zu Eulenburg, PhD

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**Basic Clinical Epidemiology**

In this course the student will apply the concepts of clinical epidemiology in the clinical context of patient-related studies.

**Entry requirements**

Courses Study design & Medical Statistics

NB. these requirements apply only for Research Master students; there are no entry requirements for PhD students

**LEARNING OUTCOMES**

- Understand how to create and manage databases
- Know strong and weak points of namely cohort and cross sectional study designs and basic measures
- Describe the basics and limitations of randomized clinical trials and costs as outcome
- Know the basics of diagnostic research

**COORDINATOR**

Prof. G.H. (Truuske) de Bock

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**Clinical Relevance versus Statistical Significance**

**NB. This course is no longer given.**

**CONTENT**

Compared to statistical significance, little attention is paid to the importance of “clinical relevance” in scientific research. In this short course, the role clinical relevance plays in sample size determination (power), describing the results and statistical testing is dealt with. Special attention is paid to determining relevance in questionnaire-based patient-related research. Students learn to determine and define a clinically relevant effect, and how to apply this information during several stages in the scientific process.

**COORDINATOR**

F.L.P. (Eric) van Sonderen, PhD

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**KEY FACTS**

**CONTENT**

**LEARNING OUTCOMES**

**COORDINATOR**

**KEY FACTS**

**COORDINATOR**

**KEY FACTS**

**COORDINATOR**
Epidemiology and Applied Statistics

Students will learn about the concepts, principles, and methods in epidemiology. The participants will familiarize themselves with study designs, methodological problems and statistical analyses. The skills learned in this course are of importance when conducting research and analyzing data as well as when evaluating published research.

In the first week the student will become acquainted with the field of epidemiology and gain knowledge on research designs, measures of frequency and association. During this week a research question is formulated, for which data have to be analyzed during the course. Further, a start is made with the applied statistics (descriptive statistics, nonparametric and parametric tests, correlations, and logistic regression analysis). All statistical analyses will be performed during practical using SPSS/PASW.

In the second week the students will familiarize themselves with the concepts of confounding and effect modification. The final statistical analyses are performed (including adjustment for confounding, interaction, and stratification). Students will give an oral presentation of 10 minutes on their research question (analyses, results, conclusion, discussion), followed by a general discussion.

Topics include:
- Study population
- Study designs (cross-sectional, longitudinal, descriptive, experimental, case-control, cohort, intervention)
- How to formulate a research question and to make it operational
- Measures of frequency: prevalence, incidence
- Measures of effect: relative risk (RR), odds ratio (OR)
- Descriptive statistics (plots, distribution, group differences)
- Associations (correlation, linear and logistic regressions)
- How to deal with confounding in the analysis (adjustment, stratification, interaction, effect modification)
- Survival analysis (Kaplan-Meier and Cox regression).

Knowledge and applicability of:
- concepts, principles, and methods in epidemiology
- study designs
- methodological problems
- statistical analyses
- able to conduct research and analyze data.

J.M. (Judith) Vonk, PhD

Health Technology Assessment; Quality-of-Life and Patient-Reported Outcome Measures (PROMs) (Research Master CPE)

Attention will be paid to useful basic models for the conceptualization of Quality of Life and health status, including Spilker’s model for QoL and Wilson & Cleary’s model of patient outcomes. Different approaches to the assessment of PROM will be discussed, including rating scales, descriptive questionnaires, and preference-based methods. Evaluate the usefulness of PROMs and the application of new PROM measurement methods in the field of health. Conceptually define the meaning and purpose of health outcomes research and its different areas. Understand the role of epidemiology, health economics, psychometrics, and biostatistics in conducting PROMs research.

LEARNING OUTCOMES

- Student will know the basic models for Quality of Life
- Student will know the basics of how to assess and interpret PROMs
- Student will be able to read and interpret articles using PROMs
- Student will understand the role of PROMs in health economics.

P.F.M. (Paul) Krabbe, PhD

Incomplete Information: Non-response, Attrition, and Missing Data

NB. At the moment this course is not given; it is uncertain whether this course will be given again in future.

This course focuses on several causes for incomplete information; how it occurs, its negative consequences and when and how to prevent and repair matters. Students will have ample opportunity to practice with datasets.

Students learn about a broad variety of types of incomplete information that can threaten both the representativeness and power of the study. Techniques to prevent or repair missing data are also dealt with.

J.M. (Judith) Vonk, PhD
Introduction to genetic epidemiological research and data analysis

In this course the participants will learn about the basic principles of genetic (epidemiological) research with a focus on family-based heritability studies as well as population-based candidate gene and genome-wide association studies. The relevant background of human genetics and statistics will be explained during interactive theoretical lectures taught by experts.

The basics of human genetics will include concepts such as DNA, single nucleotide polymorphisms, and haplotypes. Lectures will include research related issues such as the strengths and weaknesses of different study designs, the effect of population structure and population stratification, and multiple comparisons issues.

The theoretically acquired knowledge on human genetics and statistics will be applied in practical classes. The participant will get familiar with study design issues (tagging strategies, power calculation) and the basic statistics that are necessary to analyse genetic data such as descriptive data analyses, Hardy-Weinberg and Linkage Disequilibrium testing, testing of genotype effects in different types of data, and approaches to deal with the multiple testing issues. Common (freely available) statistical programs to perform genetic data analysis will be used, such as Mx, HaploView, QUANTO etc.

• At the end of the course the participant will be able to interpret the findings of a wide range of genetic epidemiological study designs, and apply several basic forms of genetic data analysis.

Prof. H. (Harold) Snieder

Measuring Concepts in Quantitative Research (Research Master CPE)

This course deals with the process of operationalizing, i.e. the translation of theoretical concepts into measurement instruments. The role that validity and reliability play in this process will be dealt with in depth. Attention will be focused on the construction and use of multi-item measurement scales. Also determining relevant effects and the relation

KEY FACTS

Intended for PhD students, Master students. Some basic knowledge of genetics and statistics is recommended

Examination Exam required

EC 1, these EC can be used for obtaining the SMBWO certificate Epidemiology.

Language English

Medical Statistics

To refresh and deepen basic knowledge on basis statistical methods for the analysis of data from health care research project. Emphasis will be given to the interpretation and understanding of these statistical methods. To support the statistical calculations the software package SPSS will be used.

The course prepares participants also for a more in-depth and detailed course on longitudinal data analysis (mixed models). The following topics will be covered: Descriptive statistics, normal and binomial distribution, study design, confidence intervals and hypothesis testing, comparison of groups of categorical and continuous outcomes, linear and logistic regression analysis, longitudinal and survival data analysis.

KEY FACTS

Intended for PhD students

Examination Written examination

EC 3.5 (with exam)

Language English

Mixed Models for Clustered Data

The aim of the course is to apply and understand mixed models for continuous, dichotomous and count outcome variables in relation to explanatory variables for cross-sectional and longitudinal data.

The family of mixed models is a very useful statistical toolbox for the analysis of clustered data (e.g. members of the same family, patients within one hospital, repeated measures of individuals, etc.). This course will provide knowledge on the concepts of linear mixed models and generalized linear mixed models for cross-sectional and longitudinal data for numerical or dichotomous outcome variables.

KEY FACTS

Intended for PhD students, Research master students

Examination Participation required, a written assignment is optional

EC 1.5 (no exam)

Language English
The course will explain and practice with general estimating equations (GEE), maximum likelihood estimation (MLE), and restricted maximum likelihood estimation (REML).

Using many practical examples, the model specification, analysis and interpretation of the results will be explained in this course. In the accompanying workshops, the course participants have the possibility of guided training using SPSS.

**The main topics of the course will be:**
- Analysis of variance models
- Linear mixed models
- Generalized linear mixed models
- Model specification approaches

For those who want to dive deeper into longitudinal data analysis, the course "Applied longitudinal data analysis" is recommended!

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**Multivariate Analyses: How to Handle Three Variables**

**NB. This course is no longer given**

The three main types of ‘third variable effects’, interaction, confounding, and mediation, are dealt with in depth. Students will have ample opportunity to practice with datasets.

Students will learn about the ways one or more ‘third variables’ can influence the relationship between the two focal variables. Students will learn to use a theoretical model to handle interaction, confounding and mediation.

F.L.P. (Eric) van Sonderen, PhD

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**Psychiatric Epidemiology**

(Research Master CPE)

**CONTENT**

Psychiatric disorders are very common and constitute a large burden on individual patients and societies. Over the past decades, large efforts have been made to improve our understanding of the mechanisms underlying psychiatric disorders and optimal ways to treat them. However, the processes that play a role in mental health are multifaceted and extremely complex, making psychiatry and psychiatric epidemiology very challenging fields of research.

This course aims to provide students with basic knowledge about the clinical characteristics, treatment, personal/societal impact, etiological models and epidemiology of different types of mental disorders (e.g. depression, anxiety, substance abuse, psychosis). Illustrated with examples of state-of-the-art research on these disorders, important methodological aspects of psychiatric research will be addressed, including: data-driven cluster methods, basic survey methods, prediction modeling, applied psychometrics and analysis and interpretation of diary-study results. Important, the implications of differences between psychiatric- and somatic-disorder epidemiology for the design, implementation and interpretation of research will be discussed. An important topic and current in psychiatric research concerns the validity of the used diagnostic classifications, scales and measurements. Because, this has important implications for all lines of psychiatric research, innovative research aiming to develop more valid diagnostics (and the involved methodology) will be presented and discussed during the course.

**LEARNING OUTCOMES**

- Basic knowledge about psychiatric disorders and their epidemiology.
- Insight into important scientific questions in psychiatry.
- A basic understanding of how innovative methods (e.g., time-series analysis, psychometrics, clustering) can be applied to answer research-questions in psychiatry.

**COORDINATOR**

K.J. (Klaas) Wardenaar, PhD
**Study Design in Clinical Epidemiology**  
*(Research Master CPE)*

In this course the principles and practice of epidemiological research are taught. The emphasis in this course is on study design. A distinction is made between theoretical design including design of the research question and operational design comprising data collection and data analysis. The dichotomies in the classification of (clinical) epidemiologic research, i.e. observational / experimental, cohort / case-control, cross-sectional/ longitudinal and their relevance to epidemiologic research will be discussed. A further distinction will be made between etiologic studies including intervention studies (clinical trials) and predictive studies (diagnostic and prognostic studies). Issues of validity and precision will be extensively addressed. Lectures will be combined with exercises using current examples of epidemiological studies on mostly chronic diseases. Reviewing recently published studies with different study designs are an important part of this course. The aim is to provide the participants with the knowledge to evaluate and judge epidemiological research and data analysis, and give a sufficient scientific and methodological background to actively participate in epidemiological studies.

**LEARNING OUTCOMES**

- Basic principles of epidemiological research, like evidence, causation, design, measures, risk, bias, error.

**COORDINATOR**  
Prof. H. (Harold) Snieder

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**Systematic reviews and meta-analysis**

Many PhD students will perform a systematic review as part of their research project. In some systematic reviews the results of several studies will be combined in a meta-analysis. This course will provide an overview of the steps, principal and practical, of systematic reviews, including design and conduct of literature searches, data extraction and presentation, assessment of study quality and examination of publication bias and other biases. The course will provide statistical methods for the combination of results in meta-analysis.

**KEY FACTS**

| Intended for | PhD students  
| Examination | 100% participation required, exam consist of the development of a protocol for a systematic review.  
| EC's | 2  
| Language | English

**COORDINATOR**  
Prof. P.U. (Pieter) Dijkstra  
Prof. U. (Ute) Bültmann  
N. (Nynke) Smidt, PhD
Working with Questionnaires in Patient-related Research

NB. This course is no longer given

In patient-related research questionnaires are often used that may not be optimally equipped for the research question at hand. Precise formulation of the concept being assessed will be dealt with as well as the subsequent steps needed to appraise candidate questionnaires. Students will learn to critically evaluate multi-item instruments that are used in patient-related research, with respect to their suitability, validity and reliability.

F.L.P. (Eric) van Sonderen, PhD

Genomics data analysis for biologists

High throughput sequencing became central element to many biological studies. Analyses of genomes, exomes, epigenomes, transcriptomes becomes a routine task in modern biology. It is important for the young scientist to have a good idea on existing approaches for data analysis, their strong points and limitations. This practical course is aiming on establishing basic skills in data retrieval, processing and analysis. It will include review on currently available databases, online tools, R-packages and other programming elements. We also discuss the basics of statistical evaluation of the obtained results.

Assumed pre-knowledge: a good understanding of molecular biology and genetics. Having experience with programming can be helpful, but is not required.

• Understanding the variety and use of NGS applications
• Understanding the sources of data and approaches for data analysis
• Become familiar with main repositories of ‘omics’ data
• Be able to retrieve the data
• Know the way to manage, analyze and integrate different datasets

V. (Victor) Guryev, PhD
L. (Leonid) Bystrykh, PhD

Image Analysis

Images are an important aspect of research data. They used to be of photographic origin, but in the last decade the use of equipment that generates digital images has steadily increased. Furthermore, the use of professional and semi-professional scanners and digital photo cameras has increased the access to digital images. Images can be a rich source of data, but frequently they are merely used as an illustration to emphasize other qualitative data. Image analysis techniques may allow us to derive quantitative data from the images themselves. Most tools are based on pixel operations in either grey value images or binary images. The combination and repetition of tools yields a powerful repertoire of processing and measuring possibilities. A selection of these tools will be explained. The effects of these tools on representative images will be studied using demonstrations and practice sessions.

T.G. (Theo) van Kooten, PhD.

Introduction into R

With over two million users worldwide R is becoming the leading software package for statistics and data science. It is freely available and has many utilities and possibilities for e.g. basic and advanced statistical analysis; creating sophisticated graphs; data handling; and writing software. As such R is a very convenient software package since it allows you to create scripts for data handling, analysis, and visualization and to have your results and figures for your paper in one run, which cannot be done with statistical packages like SPSS, SAS or Stata.

However for many researchers it is not directly clear how to use R, because of the R language and the way of reasoning. We would therefore like to introduce the students to and familiarize them with R. After finishing this introductory R course, you will master some very valuable R skills and will be ready to do your own data analyses.

In the first part of this course you will learn the basics of R through short lectures and many computer exercises. The following topics will be treated: the R language, R variables (objects), R data structures, reading and writing data files, manipulating datasets, making graphs, performing basic statistics (only one day!), simulations, and creating functions.

In the second part you will be given an assignment (case study) that challenges you to utilize of the lessons from the first part. You will work out the assignment on your own or, if you like, with a fellow student under the supervision of the teachers. You will write a report that
includes the script that you developed, explains the steps followed, explains the problems that you encountered and how you solved them, and presents the outcomes. You will get feedback on this report.

This course is aimed at people who’d like to start using R. No previous experience in programming languages or data science is required, but knowledge of basic statistics (e.g. Student’s t-test, chi-square test, correlations, regression analysis) is required.

I.M. (Ilja) Nolte, PhD

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**Microscopy within Kolff**

**CONTENT**

The aim of this course is to create a basic understanding of the principles of light and electron microscopy. In addition, students learn how microscopy can be used in performing research. Several microscopic techniques will be highlighted in the course.

The course is mainly aimed at students within Kolff to familiarize them with the possibilities.

**KEY FACTS**

- Intended for: PhD students, Research master students
- Examination: Participation required
- EC: 0.25
- Language: English

**COORDINATOR**

T.G. (Theo) van Kooten, PhD

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**In vivo imaging using IVIS**

**CONTENT**

In Vivo Optical Imaging is a non-destructive technique which enables direct monitoring of luminescent or fluorescent cells and microbes in vivo (both in animal models and humans). This technique has recently been successfully applied in oncological studies with luminescent cell lines that would otherwise require histopathology to identify, as well as in bio-adhesion studies with fluorescently labeled and luminescent bacteria which study the development of bacterial bio-layers that cause biomaterial associated infections. The course will evaluate the optical technique, stressing the quantification of the optical IVIS image. To this end, relevant optical principles will be discussed such as the origin and character of bioluminescence and fluorescence, scattering and absorption in tissue affecting the intensity of the image, the theory of radiance and the first principles of optical 3D tomography enabling the exact location of the light emitting source inside the body, spectral unmixing, image acquisition and image processing. A number of fluorescent probes will be discussed in relation to the cell metabolism with which they interfere. The several advantages of the system for diverse applications as well as on the pitfalls and concerns to deal with while applying the technique will are discussed.

T.G. (Theo) van Kooten, PhD.

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**Phase II/III Clinical Trials**

**CONTENT**

Clinical trials are conducted to demonstrate the efficacy and safety of new interventions (e.g. drugs, medical devices, surgical procedures, or public health changes) in a predefined target population. The efficacy is the therapeutic effect measured by a relevant clinical outcome (e.g. improve life expectancy, cure the disease, increase quality of life) and safety is possibly measured by side effects and evaluated in relation to the therapeutic effect. Introducing new interventions requires in principle three phases of clinical trials before it can be approved by the appropriate authorities. This course focuses mainly on the methodology for the second and third phase of clinical trials.

**LEARNING OUTCOMES**

At the end of the course, the participants:

- Have general knowledge on clinical trials
- Have detailed knowledge on methodological issues in phase II/III trials

At the end of the course, the participants should be able to:

- Describe the different phases in the clinical development program of a medicine
- Explain the difference between uncontrolled and comparative designs for phase II clinical trials
- Describe Simon’s optimal two-stage designs for phase II clinical trials
- Perform sample-size calculations for phase II clinical trials
- Describe different designs for phase III clinical trials, including parallel-group design, cluster randomized designs, and stepped wedge designs
- Describe different randomization strategies for parallel-group designs, including complete randomization, random allocation rule, permuted-block randomization, and group randomization
- Explain the difference between superiority, equivalence, and non-inferiority testing

**KEY FACTS**

- Intended for: PhD students, Research master students
- Examination: no examination, but assignments
- EC: 1.5
- Language: English
- Describe how regulators use the data collected in phase II/III clinical trials to reach an opinion regarding the marketing authorization of a new medicine

**QCM - Quartz Crystal Microbalance**

In this lecture two different techniques will be explained. QCM is a very sensitive balance which can accurately measure attached mass on a surface both in dry and wet conditions (having a mass sensitivity of 18 pg/mm²). Under wet conditions adsorption of polymers such as proteins on surfaces is a very relevant phenomenon with regard to biomaterials placed inside the human body. QCM not only measures the adsorbed mass but also tells us about the mechanical properties of the adhered mass which is connected to the polymer configuration and arrangement. During the lecture, applications regarding polymer and cellular adhesion will be discussed. LLMT is a self-assembled mechanical tester capable of performing tension, compression and shear tests on samples of biological interest, e.g. tissue, tissue replacement polymers such as artificial eye lenses, artificial skin, bio-films etc. Since most of the biological material is visco-elastic in nature, specialized tests like stress relaxation and creep tests can be performed. Models can then be fitted to the measured data to evaluate the visco-elastic parameters. Examples will be given using bio-film and lenses.

T.G. (Theo) van Kooten, PhD

**Surface Characterization**

Content During this course, you will learn how to determine wettability by contact angles, charge by zeta potentials or streaming potentials, elemental surface composition by X-ray electron spectroscopy and surface roughness by atomic force microscopy. Furthermore, you will learn what you can further do with the introduced equipment and how to handle the data from the measurements.

T.G. (Theo) van Kooten, PhD

**X-Ray Photoelectron Spectroscopy (XPS)**

XPS can be used to determine the elementary composition of solid surfaces. How this technique works will be explained and which information it may provide. Anyone doing research on surfaces needs to know the chemical composition of the surfaces involved in order to know why tissue cells or bacteria behave in a certain way.

**SMBWO Immunology Course on HLA Typing and HLA Antibodies**

A three-day course consisting of lectures and practical laboratory work on human leukocyte antigens (HLA), HLA typing, antibodies against HLA and organ transplantation. Participants will perform a serological and molecular HLA class I and II typing.

To fulfill the SMBWO criteria for:
- HLA of H-2 typing (serological and molecular biological).

C. (Caroline) Roozenaal, PhD
GSMS Courses

Field Specific & Interdisciplinary Subjects
BCN Philosophy of Neuroscience

The last two decades have seen an explosion of research within and related to the neurosciences. Much of this research has philosophical implications that have hardly been articulated so far. In this course, we will introduce and discuss a number of philosophical topics that are influenced by, and influence, current neuroscience research (in a broad sense). These topics range from new developments on “standard” philosophical issues to “new” issues that derive from current work in the neurosciences.

The following topics will be discussed:
- Introduction: Philosophy, neuroscience and mind
- Brains are not persons: A Wittgensteinian critique of neuro-nonsense
- Localizing functions in the brain: The new phrenology?
- Heterophenomenology: How to study experience?
- Levels and emergence: Connections between large and small
- Explaining through mechanisms: How do the neurosciences explain?
- Other minds and mirror neurons: Social brains and recognizing others
- My body and I: self-consciousness and first-person perspective.

Knowledge about the topics dealt with in the course and are capable to use this knowledge in speech and in writing

Able to give their informed opinion on the topics dealt with in the course in speech and in writing

Able to read and understand, on their own, other texts that relate to these topics.

Prof. F.A. (Fred) Keijzer, PhD

BCN Human Neuroanatomy

Theme of the course: the human central nervous system.

Topics covered include: vertebral column, skull, spinal cord, meningeal and vascular systems, brainstem, cerebellum, limbic system, thalamus, hypothalamus, basal ganglia, cerebral cortex, sensory systems, motor systems and higher order processing.

Advancement Drug Delivery & Drug Targeting

In recent years, new chemical and biotechnological entities have been developed and several of these compounds have already entered the stage of preclinical and clinical development. In the development of new products, one of the main scientific challenges is to deliver the drug in a controlled way at the desired site of action.

The Advanced Drug Delivery & Drug Targeting course will be given by experts in the fields of:
- Drug formulation and delivery via various routes of administration
- Targeting drugs to the site of action
- The use of cell culture and in vivo systems in the design of novel drug delivery systems
- Vaccine and protein delivery by the parenteral, mucosal and dermal route
- Translation of a concept to a product

This course will provide an in-depth overview of the newest strategies and achievements in the drug delivery and targeting field. Particular emphasis will be given to the delivery of macromolecules, including vaccines, proteins and genetic material. In addition, the use of cell culture systems and in vivo models in the development of drug delivery systems will be thoroughly discussed.

The participants will work in groups on assignments in which they will address various issues relevant to the development of therapeutic strategies employing drug delivery and drug targeting technologies. Online computer facilities are available throughout the course for the assignments and for preparing the oral presentations that accompany the assignments.

- Pharmacokinetic considerations underlying the why of drug delivery/drug targeting
- State-of-the-art tools, techniques and formulation approaches in drug delivery and drug targeting
- Pharmacological and pathophysiological issues related to the subjects presented

Prof. G. (Ingrid) Molema
Quantitative Bioanalysis

Bio analysis refers to the analysis of biological samples, i.e. fluids and tissues obtained from living organisms such as animals and humans.

In quantitative bio analysis, the concentrations are determined of all kinds of molecules in biological samples. As such, it is very important for pharmaceutical and medical research, because many conclusions about the state of health of a person and about the efficacy and safety of pharmaceutical treatment are based on the concentrations of drugs and of endogenous compounds (or biomarkers) in body fluids.

This course discusses the quantitative aspects of bio analysis. The focus will be on the role of quantitative bio analysis in research and development of new drugs, but the information has a broader applicability to other types of pharmaceutical and medical research. Recently, there have been many developments in the field of quantitative bio analysis, both with regard to the technologies used and with regard to regulatory aspects, i.e. the procedures that are applied to ensure the scientific reliability of the results. The course will give an in-depth overview of all these issues, covering both theoretical and practical aspects. Case studies will be presented to illustrate the importance of a proper scientific approach.

- Good working knowledge of the different contemporary techniques for quantitative bio analysis.

Co-ordinator:
Prof. N.C. (Nico) van de Merbel

Techniques in Molecular Biology

This is a practical course where students will be introduced in Basic laboratory techniques in molecular biology. It is a full-time course (from 9.00 – 17.00 hours) and after completion of the course, the participants will receive a certificate.

Theoretical background concerning structure and function of DNA, RNA and proteins, at textbook level, and familiarity with basics of laboratory manipulation are prerequisites for attending the course. In case of any doubts, please contact the course director prior to the course.

The following topics will be dealt with experimentally: plasmid isolation and characterization, transfection, Western blotting, primer design, PCR applications like real time PCR, cloning, RNA interference, immuno-histochemistry, FACS, fluorescence: GFP.

Next to the practical work there are lectures (“mastertalks”) about several techniques used in molecular biology research at the UMCG.

A provisional time sheet of the course will be sent out by email in due time. The final course book and accompanying material will be available one week before the start of the course.

- Good working knowledge of the different contemporary techniques for quantitative bio analysis.

Co-ordinator:
M.G.L. (Marja) Brinker, PhD

Basics in Medicine (Research Master CPE)

The course covers the major areas of clinical practice, and focuses on the major disease groups. Topics include cardiology, oncology, nephrology, pulmonology, endocrinology, rheumatology and musculoskeletal disorders, immunology and infectious diseases and gastroenterology.

Objective
To understand the basic principles of medicine, notably anatomy, physiology, principles of pathophysiology, disease manifestations, elementary diagnosis and treatment.

Participants will acquire general medical knowledge (etiology, pathophysiology, diagnosis, treatment and prognosis) of the most common (chronic) diseases and their epidemiology (incidence and prevalence, risk factors, trends).
Basics in Psychology and Psychosocial Factors (Research Master CPE)

The course gives an overview of major theories and concepts of psychology so that students will be able to describe and explain key concepts and theories of psychology. The interactive lectures cover methods of psychology (research, diagnostics), processes of learning, explanations of behaviour, stress, motivation and emotions, personality and social cognition, social influence, memory and intelligence, cognitive and social development, abnormal behaviour and treatment of psychological disorders. Students will work on group assignments how to work with the concepts in daily life and how they relate to serious illness. This course prepares students to follow the courses Health Psychology and Advanced Health Psychology.

LEARNING OUTCOMES
To learn the key theories of psychology and to be able to apply this knowledge on specific psychological questions.

COORDINATOR
Prof. M. (Mariët) Hagedoorn
M. (Marrit) Tuinman, PhD

Health Psychology Research (Research Master CPE)

During the Health Psychology course students will learn the basics of Health Psychology.

Attention will be paid to the following themes:
- Health care context
- Health behaviour change
- Adjustment to chronic illness
- Psychological interventions
- Quality of life
- Ageing

- Describe relevant theoretical concepts in the field of Health Psychology
- Interpret the main aim or research question of a scientific article
- Explain the conclusion or answer to the research question of a scientific article
- Balance methodological quality and feasibility
- Discuss and present research articles.

COORDINATOR
Prof. A.V. (Adelita) Ranchor
K.A. (Annika) Tovote, PhD

Health Psychology Research; advanced course

Building on the course "Health Psychology", this course focuses on four important themes in the field of health psychology, namely etiology of illness and survival, adaptation to somatic illness, psychological interventions for patients with a somatic illness, and changing health behaviour. The aim is to provide knowledge and insight in the most recent developments in psychological and medical-sociological theories relevant for theory-driven research in medical settings, as well as for evaluating the effects of psychosocial interventions among patients with a somatic disease.

Each topic will be addressed in two meetings (2 hours each). During the first meeting, the group will discuss relevant literature. Students receive a reading assignment to prepare themselves for this discussion. For the second meeting, students will receive a writing assignment (± 750 words), which can vary from "write a critical review of the literature" to "write a newspaper article based on the literature". During the meeting, students will receive feedback from fellow students and the teacher.

The course will be completed with a final assignment. Students have to search for additional literature and write an essay with respect to one of the four research themes.

One of the teachers will supervise and be available for providing feedback.

COORDINATOR
Prof. M. (Mariët) Hagedoorn
Modelling in Health Technology Assessment (Research Master CPE)

Objective: Students will learn to design, implement, and analyze health economic decision models. They will learn to judge what input data are needed to populate their model and from what sources these can be obtained. An introduction will be given to several statistical techniques needed to obtain useful input data and to analyze the model output. Insight into the role of sensitivity analysis and the different options for this will be given.

Description: During the week, the book of Briggs et al. will be studied intensively, by having interactive lessons. Practical work will also be included with smaller exercises, as well as working on building a simple but complete health economic decision model.

Topics to be addressed include among others:
- The role of models and especially health economic decision models
- Different types of models (decision trees, Markov, patient level models)
- Criteria for a well-developed and reported model, model validation
- Available software
- Interpretation of results, taxonomy of uncertainty, Monte Carlo simulation, and an introduction to value of information analysis

Entry Requirement
Excel; Statistics; Course ‘Health technology assessment and economic evaluation’ or similar level of basic HTA knowledge. In case of doubt please contact the course coordinator.

Cell (bio)material interactions
Biomaterials are an integral part of the life of many PhD students within the W.J. Kolff Institute (WJKI). Even the most fundamental research is likely not to be performed without using an actual material. Demands are made to implant materials in relation to their interactions with surrounding tissues, cells and blood (cells). In this short course, participants will be introduced to the biology of the cell in terms of headlines. Then, examples will be used to elucidate a number of important aspects of cell-material interactions, including the influence of material surface properties. Techniques for analyzing these interactions will also be addressed.

T.G. (Theo) van Kooten, PhD

Blood-Material Interactions
Manufacturers of medical devices want their devices to be safe and biocompatible. It has been recognized that blood compatibility of materials is of pivotal importance for the compliance of blood-contacting devices. Blood in itself can be considered a very complex and intriguing organ with extensive interaction with all parts of the human body.

The components of blood and some of the regulatory pathways will be presented. The implications for the scope of testing will also be discussed. Five testing categories have been outlined in the recently harmonized and published standard EN ISO 10993 – Part 4: ‘Selection of tests for interactions with blood’. Aspects include materials characterization of medical devices and materials and biomaterials; in-vitro tests for blood compatibility; sample analyses from in-vivo studies; and batch release testing for finished products.

Moreover, test conditions must consider the clinical use of the device, which implies testing in circulating blood. Finally, testing methods for studying blood-material interactions will be presented (ELISA, RIA; EIA, colorimetric methods; enzymatic assays; clotting assays; platelet functionality; antibody-binding studies; and fluorometric and luminometric methods).

T.G. (Theo) van Kooten, PhD

Cell (bio)material interactions

Entry Requirement
Excel; Statistics; Course ‘Health technology assessment and economic evaluation’ or similar level of basic HTA knowledge. In case of doubt please contact the course coordinator.

Co-ordinator T.L. (Talitha) Feenstra, PhD

Blood-Material Interactions

Co-ordinator T.G. (Theo) van Kooten, PhD
Colloid Stability

Living systems as well as many abiotic materials that are used in medical and pharmaceutical applications are heterogeneous. It implies that they are structured at sub-micron level, the so-called colloidal domain. In this short course, the various types of interaction that determine colloidal stability are discussed. Insight into these interactions allows manipulation of colloidal stability and, consequently, structural properties.

T.G. (Theo) van Kooten, PhD

DLVO theory and introduction

Topics that will be discussed are:
• Surface energy
• Adhesion thermodynamics
• DLVO.

This lecture will provide basic understanding of quantification of surface hydrophobicity in terms of surface free energy and surface charge in terms of zeta-potentials. Furthermore, prediction of adhesion between two surfaces will be explained using both the thermodynamics and the DLVO theory.

T.G. (Theo) van Kooten, PhD

Polymers in Medicine

A fundamental overview of polymer properties: shape, structure (surface as well as bulk), degradability and other characteristics that can have an influence on the use of polymers in clinical applications, and of their synthesis and the methods to modify their surface structure in order to make them more suitable for clinical applications. Furthermore, there will be a lab tour and demonstrations of several techniques.

T.G. (Theo) van Kooten, PhD
GSMS Courses

Seminars / Symposia / Meetings
BCN Lectures

Each year, some nine leading researchers from the Netherlands or abroad will be invited to give a lecture. The guest speakers will be invited for several days, during which PhD students will have the opportunity for informal interaction.

Prof. R.A. (Robert) Schoevers

BCN Master Classes

Whereas most of the other courses organized by BCN cover large parts of the research field of the behavioural and cognitive neurosciences, each master class deals with a specific theme, the theme of the invited master academic, an internationally outstanding researcher. Only those BCN PhD students whose research interest is closely related to that of the guest lecturer are invited to participate in the class. Participants will receive study material to prepare for the master class. Furthermore, they will be asked to formulate a question or statement they wish to discuss with the scientist involved before attending the class.

Prof. R.A. (Robert) Schoevers

BCN PhD Retreat

All BCN PhD students will be invited to the Retreat. Students who are in the second and fourth years of their project are invited to give a 8-minute presentation on their project, followed by a 7-minute discussion. All participants are expected to be actively involved in the discussions following the presentations. Two senior staff members will provide feedback to the speakers.

- Make a distinction between what to keep and what to omit from the presentation
- Organize a presentation such that it is easy to follow
- Create presentations that will keep the attention of the audience
- Explain your research to fellow PhD students and senior scientists, both within and outside your field

Prof. R.A. (Robert) Schoevers

BCN Symposium

BCN organizes a themed symposium once a year. The symposium is a one-day activity with lectures for a broad audience during the morning and three workshops in parallel sessions during the afternoon.

Prof. R.A. (Robert) Schoevers

Cancer Research Center Groningen (CRCG) Annual PhD student meeting

In this meeting, intended for CRCG PhD students and their supervisors, CRCG PhD students present their work through posters and oral presentations. Also a keynote speaker is invited.

Prof. M.A.T.M. (Marcel) van Vugt

Molecular Medicine Seminar Series

The Departments of Cardiology, Cell Biology, Hematology, Pathology, Epidemiology, Medical Biology, Medical Oncology, Genetics, and Neuroscience, and the Institute for Healthy Ageing, together with the Wenckebach Instituut of the UMCG, organize a series of lectures on topics related to Molecular Medicine in its broadest sense. Prior to each lecture a workshop is scheduled in which a selected group of 4 or 5 PhD students/postdocs will discuss their work with the speaker of the day.

Wenckebach Institute
SHARE day

Once a year the SHARE PhD council organizes the SHARE day for all SHARE PhD students and senior researchers. There are plenary sessions and workshops with a variety of topics interesting for all researchers.

PhD council

**KEY FACTS**

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**CONTENT**

Once a year the SHARE PhD council organizes the SHARE day for all SHARE PhD students and senior researchers. There are plenary sessions and workshops with a variety of topics interesting for all researchers.

**COORDINATOR**

PhD council

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External Courses
BCN Advanced (non)linear regression techniques in R

CONTENT

Many PhD students have to analyze complex datasets which involve repeated measurements, which are sometimes collected over time. In this course you will learn how to take into account this structural variability in your data using mixed-effects regression (also known as hierarchical regression or multilevel modeling). In contrast to repeated-measures ANOVA, the advantage of this approach is that no (perfectly) balanced dataset is required. Furthermore, as a regression approach, covariates can be easily included. Besides focusing on linear relationships, we will also focus on non-linear relationships between (combinations of) predictors and the dependent variable. To model these non-linear patterns, we will use generalized additive modeling. This approach in particular is very useful for analyzing any type of time series analysis (such as reaction time data, EEG data, eye tracking data, etc.).

Given that the teacher has a background in linguistics, the examples used in this course come from that field. However, the methods are easily applicable to data from other fields, and students are encouraged to bring their own data to work on during the lab sessions.

This course consists of 5 lectures:
• Linear mixed-effects regression using reaction time data
• Generalized linear mixed-effects regression using eye tracking data
• Generalized additive modeling (1D) using articulatory data
• Generalized additive modeling (2D) using EEG data
• Generalized additive modeling (nD) using data from geolinguistics

Each lecture consists of about 2 hours of lecture followed by an additional 2 hours of lab session (students have to bring their own laptop).

• Being able to interpret and conduct a linear mixed-effects regression analysis
• Being able to interpret (including visualization) and conduct a generalized additive modeling analysis

M.B. (Martijn) Wieling, PhD

KEY FACTS

Intended for PhD-students
Examination Participation required
EC 2
Language English

Career Perspectives Series

The Career Perspectives Series (CPS) was developed by the Groningen Graduate Schools to enable PhD students to think about their future career steps and prepare for that moment after they have received their PhD degree. By enrolling in CPS courses and workshops during your studies, you can develop your talents and skills beyond research and discover the various career possibilities awaiting you after your PhD.

• What transferrable skills can I develop now for a future career inside or outside academia?
• How can I apply these skills in my professional career?
• What job opportunities are possible for PhD graduates?

The courses and workshops within the Career Perspectives Series focus on three main areas:
• Information and Awareness.
• How do I get started in Academia?
• How do I get started in a Non-Academic career?

Further information: www.rug.nl/phd-cps

Cellular Imaging Light

CONTENT

Introduction in microscopy. Topics include light, fluorescence, electron microscopy, probes & labelling strategies – with a brief mention of F-techniques- and image analysis. All lectures are by local staff, a tour of the UMIC is included.

Registration: email g.noppert@umcg.nl

COORDINATOR

B.N.G. (Ben) Giepmans, PhD

KEY FACTS

Intended for Technicians, PhD students, Post-docs, internships students.
Participation costs for PhD-students: € 50,-
Number of participants: 24
EC 1 (includes examination)
Language English
**Cellular Imaging Basic**

Microscopy for bioimaging, including hands-on demonstrations. Topics include light, fluorescence, electron microscopy, probes & labelling strategies, super resolution microscopy, FRET, FRAP, FLIP, CLEM and image analysis. Lectures and demonstrations are by local staff and national experts, emphasis is on hands-on experience in demonstrations.

Registration: email g.noppert@umcg.nl

B.N.G. (Ben) Giepmans, PhD

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**Cellular Imaging Advanced**

Topics are centered on advanced fluorescence & electron microscopy and probes & labelling strategies, including super resolution, FRET, FRAP, CLEM, ColorEM and image analysis. (Inter)national experts will present implementation of bioimaging in research. In week 2 you will implement Cellular Imaging hands-on in your project. Note that, as opposed to previous editions, this is a full-day extensive program.

Registration: email g.noppert@umcg.nl

B.N.G. (Ben) Giepmans, PhD

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**Laboratory Animal Science**

The objective of the course is to educate course participants in the field of Laboratory Animal Science. Scientists who are responsible for the design and performance of animals experiments must not only be educated in one of the biomedical sciences (biology, medicine, veterinary medicine, pharmacy, etc.), but should also have taken a course in laboratory animals science, encompassing welfare issues, ethical aspects and alternatives to animal experiments. This requirement has been made compulsory by Dutch law (Article 9, Experiments on Animals Act).

The course covers a multidisciplinary range of subjects including legislation, experimental design, microbiology, anesthesia, analgesia, peri-operative care, stress/ wellbeing and behavior, experiments on animals living in the wild, pathology, housing and care, ethics, etc.

M. van der Meulen-Frank

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**Central Medical Library Courses**

Medical Library courses can be taken at the UMCG Central Medical Library. Participants must be connected with or employed by the UMCG, or studying at the UMCG. Courses in Searching for literature are strongly recommended. It is also possible to make an individual appointment for a literature search.

UMCG/CMB

Detailed information: www.rug.nl/bibliotheek/locaties/bibcmb/cursussen/index
Staff PhD program
GS office

Maaike Bansema
Tel. +31 (0)50 36 16478
Email: m.h.bansema@umcg.nl

Judith Barthel
Tel. +31 (0)50 36 10483
E-mail: j.m.barthel@umcg.nl

Paulien de Haan
Tel. +31 (0)50 36 11145
E-mail: p.de.haan01@umcg.nl

Joyce Fongers
Tel. +31 (0)50 363 7804
E-mail: j.e.fongers@rug.nl

Diana Koopmans
Tel. +31 (0)50 36 16775
Email: d.h.koopmans@umcg.nl

Kiki Koster
Tel. +31 (0)50 36 12563
E-mail: k.e.koster@umcg.nl

Renate Kroese
Tel. +31 (0)50 36 16777
Email: r.c.kroese@umcg.nl

Evelyn Kuiper
Tel. +31 (0)50 36 16778
E-mail: e.t.kuiper-drenth@umcg.nl

Mathilde Pekelaer
Tel. +31 (0)50 36 16481
E-mail: m.t.l.pekelaer@umcg.nl

For more information on the courses, availability, and contact persons see the following links:
www.rug.nl/gsms
www.rug.nl/research/gradschool-medical-sciences/phd-programme/courses
https://cursus1.webhosting.rug.nl/gsms/all-gsms-courses/