Graduate School of Medical Sciences of the University of Groningen
at the University Medical Center Groningen.
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Overview of this study guide

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Welcome
Welcome to the Graduate School of Medical Sciences

The Graduate School of Medical Sciences (GSMS) organizes all (research) master and PhD tracks within the University Medical Center Groningen (UMCG). In addition, the five research institutes of the UMCG are incorporated in the Graduate School of Medical Sciences.

The Research Institutes are:
1. BCN (Behavioural and Cognitive Neurosciences)
2. CRCG (Cancer Research Center Groningen)
3. GUIDE (Groningen University Institute for Drug Exploration)
4. W.J. Kolff Institute (Institute for Biomedical Engineering and Materials Science)
5. SHARE (Science in Healthy Ageing and healthcaRE).

These institutes regulate the research policy in their fields and organize institute-specific courses for the education programs of the Masters and PhD tracks. The University of Groningen and the UMCG focus on Healthy Ageing as a unifying theme of research.

Every PhD student doing research in a medical sciences-related field is registered in the Graduate School of Medical Sciences. This applies for everyone preparing a PhD thesis (dissertation). There are several categories of PhD students, ranging from the regular 4 years’ PhD student to the research fellow and the external candidate (extraneous).

From the very start you will register and control your research and development activities in the RUG registration system Hora Finita, while the Graduate School provides a balanced mix of expert supervision, tailor-made graduate training and the freedom to pursue your own ideas within relevant research themes. In some cases part of the research can be carried out abroad.

Registration in GSMS gives access to the courses and activities in the graduate school’s education program. Participation in the courses of the program is free of charge. Apart from taking courses, it is important that the PhD students become familiar with activities related to the transfer of knowledge, such as keeping up with professional literature, participation in work discussion meetings and reference meetings and active participation in national and international scientific meetings. This booklet will help find your way in the organization and educational activities of the Graduate School of Medical Sciences.

All information and course registration is available at the GSMS website. I hope you will enjoy your time as a PhD student in our Graduate School and wish you success in achieving your ambitions,

M.J. (Martin) Smit, PhD
Director Graduate School of Medical Sciences

Website and online course registration: www.rug.nl/gsms
Fan page: www.facebook.com/GSMedSciencesGroningen
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Organization of the Graduate School of Medical Sciences
Important Facts

Registration

Every researcher doing doctoral research in one of the research institutes of the Graduate School must be registered at GSMS. To register, please fill out the GSMS Registration Form and hand it in at your research institute’s office (see below).

Hora Finita RUG registration system

Registration with the GSMS gives access to the Hora Finita registration system of the University of Groningen. In this system all details concerning the PhD student and the project will be registered, monitored and processed. This involves the admission to the PhD program, progress reports, courses taken, the assessment of the thesis and the organization of the Defence Ceremony. All PhD students have to use this system: www.horafinita.nl. Login with your RUG P-number and pass word.

Registration with the GSMS gives access at no cost to participation in GSMS courses, and financial support for scientific activities. Registration forms can be downloaded from the website: www.rug.nl/gsms

PhD students from outside the Netherlands are supported by the International Office of the Education Institute of the UMCG and the International Service Desk of the University of Groningen. Here, assistance is provided with immigration procedures, visas, and initial temporary housing in Groningen.

International Office Medical Sciences:
www.rug.nl/umcg/informatievoor/internationalisering/

International Service Desk:
www.rug.nl/feb/informatievoor/exchangestudents/practicalInformation/Facilities/ISD

GS office

The Graduate School Office on the 7th floor of “De Brug” is the organizational center of the Graduate School of Medical Sciences. The five research institutes (BCN, CRCG, GUIDE, W.J. Kolff Institute and SHARE) organize scientific activities that are tailored to the institutes’ specific fields of research (including field-specific and interdisciplinary subjects). Detailed information on these subjects can be obtained at these institutes. Contact persons and addresses are given on page 8.
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 page 7)
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:
4 years: 30 EC
3 years: 22.5 EC
2 years: 15 EC

1 EC = 28 hours approx. (of contact time or working hours on a subject)
The GSMS Degree program advisory committee is responsible for assigning the EC.

**ECTS credit points can be obtained by:**
1. Taking courses in the GSMS education program
2. Taking courses at other institutes and organizations
3. Taking Research Master’s program courses
4. Conducting research activities.

It is important to know that the courses taken at other institutes and organizations are at least on Master’s level. Bachelor courses cannot be accepted in the PhD education program.

In addition to taking courses, it is important that PhD students 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.

**EC for research related and academic activities**
This scheme describes how several activities will be rewarded. Please note that it shows a lot of opportunities for PhD students to get rewarded with credits beyond the regular course work.

When things either are not clear or you have additions to suggest – please ask one of the PhD representatives in the GSMS Education Committee (phdcouncilgsms@gmail.com)
<table>
<thead>
<tr>
<th>Activity</th>
<th>Credits</th>
<th>Max¹</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>Seminars / Journal clubs</td>
<td>0.1/seminar</td>
<td>2 EC</td>
<td></td>
</tr>
<tr>
<td>Presenting data at international conferences (orally and poster)</td>
<td>0.5/conf</td>
<td></td>
<td>6 EC</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;&gt; 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/2 ms</td>
<td>3 EC</td>
<td>Depending on time invested (28 hrs per EC)</td>
</tr>
<tr>
<td>Research stay abroad (minimum 2 weeks)</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>
<tr>
<td>Stay in Dutch lab</td>
<td></td>
<td>4 EC</td>
<td></td>
</tr>
<tr>
<td>Other academic activities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>GSMS PhD council</td>
<td>1 EC/yr</td>
<td></td>
<td>Depending on time invested and agreements within Research Institutes</td>
</tr>
<tr>
<td>GSMS educational committee</td>
<td>1 EC/yr</td>
<td>6 EC</td>
<td></td>
</tr>
<tr>
<td>Research Institute’s PhD councils</td>
<td>1 EC/conf</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Organisation of scientific meeting (symposium/ conference)</td>
<td>1 EC/conf</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Teaching/Student supervision</td>
<td></td>
<td>4 EC</td>
<td>According to Institute for Medical Education</td>
</tr>
<tr>
<td>Tutor/mentor</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Lecture</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Coach master scientific thesis</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Definitions:
- ¹ 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

1 EC = 28 hours invested
1 EC = ± 120 pages of obligatory literature
Organization and Contact Persons

Graduate School of Medical Sciences

**Visiting address:**
Building 3217 “De Brug”, FA33
Ant. Deusinglaan 1
9713 AV Groningen
The Netherlands

The Graduate School of Medical Sciences deals with five main scientific areas, along the lines of which the teaching program has been developed. The five areas are:

- Behavioural and Cognitive Neurosciences (BCN)
- Oncology (CRCG)
- Chronic Diseases and Drug Exploration (GUIDE)
- Biomedical Engineering and Material Science (KOLFF)
- Health Research (SHARE)

Each subject is represented by an institute with its own office dealing with course organization and registration in its particular field.

### Behavioural and Cognitive Neurosciences (BCN)

- **Scientific Director:** Prof. H.W.G.M. (Erik) Boddeke
- **Secretary:** Ms. E.T. (Evelyn) Kuiper-Drenth (e.t.kuiper-drenth@umcg.nl)
- **PhD and education coordinator:** Ms. D.H. (Diana) Koopmans (d.h.koopmans@umcg.nl)
- **Phone:** +31 (0)50 363 4734
- **Education:** Ms. D.H. (Diana) Koopmans (d.h.koopmans@umcg.nl)

### Oncology (CRCG)

- **Director:** Prof. E. Vellenga
- **Secretary:** Ms. M.T.L. (Mathilde) Pekelaer (m.t.l.pekelaer@umcg.nl)
- **Phone:** +31 (0)50 363 3163
- **Education:** Ms. M.H. (Maaike) Bansema (m.h.bansema@umcg.nl)
Research Master’s Programs

In addition to the PhD program the Graduate School of Medical Sciences administers three Research Master’s Programs:

1. Behavioural and Cognitive Neurosciences (BCN N-track)
2. Clinical and Psychosocial Epidemiology (CPE)
3. Medical and Pharmaceutical Drug Innovation (MPDI)

ad 1. Program coordinator I.A. (Ika) Neven, PhD (i.a.neven@rug.nl)
ad 2. and 3. Program coordinator D.F. (Désirée) Jansen, PhD (MastersGSMS@umcg.nl)

The two-year Research Master’s programs offer an excellent preparation for a research career in biomedical or health sciences. Only the best students from all over the world are admitted. Students will be supervised by the most outstanding scientists our University numbers. The training program is intensive and highly interactive. All three programs share the philosophy that research skills are best learned in a “learning by doing” approach.

These programs prepare students for performing a PhD project, and give an extra boost to career perspectives. Talented students have the opportunity to design their own PhD project and the best proposals are granted. After successfully completing one of the Research Master’s programs you will receive an MSc degree.
PhD-students have limited access to the courses of the Research Master’s Programs.

Detailed information:
www.rug.nl/gsms

Confidential Advisor

PhD students who experience undesirable conduct, unequal treatment of problems in cooperation at work may consult the confidential advisor.
Name: Riekje Banus (h.m.m.banus@umcg.nl)
General Information for PhD students

Courses

The Graduate School of Medical Sciences (GSMS) offers a wide range of courses for additional training of PhD students, MD/PhD students, Top Master’s students and Research Master’s students. Included are courses in general competences, in research techniques and in field-specific and interdisciplinary subjects. Also listed are the seminars and meetings organized by the five research institutes.

PhD students have limited access to research master’s courses. Research master’s students have precedence.

Foreign PhD students

The Medical Faculty has an International Office which provides advice and support to international students and guests. The Office cooperates closely with the International Service Desk of the University of Groningen.

The International Office can provide detailed information on a variety of subjects such as health matters, visas, registration with the municipality, driver’s licenses, University facilities, daily life in Groningen, etc.

Detailed Information:
Faculty of Medical Sciences International Office:
www.rug.nl/umcg/education/international-students/

University of Groningen International Service Desk:
www.rug.nl/isd

Funds and Financing

Only registered PhD students can participate in courses for free and receive financial support for scientific activities such as external courses, science writing, attending conferences etc. Application forms can be downloaded from the website. In the near future application can be performed in the Hora Finita system.

Financial support to a maximum of € 600 a year p.p. for:
- National and international conferences
- External courses
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) education, 2) speed, 3) quality. Each criterion renders € 200. Information and application form:
Name: Ms. J.W. (Mieke) Kapteyn (j.w.kapteyn@umcg.nl)

Information for GRIP PhD students:
GRIP PhD students must apply for financial support of the printing costs at the Graduate School of Science. Detailed information can be found at: www.rug.nl/gradschoolscience/.

Important!
GRIP PhD students are registered both in the Graduate School of Medical Sciences (UMCG) and in the Graduate School of Science. They make use of all facilities, and educational and financial GSMS support, mentioned above. The GSS ITB (International Training Budget) is NOT applicable to GRIP PhD students.

Introductory Event University of Groningen
Apart from local introductions, the Dean of the Groningen Graduate Schools (GSS), Prof. Lou de Leij, also invites newly started PhD students to join the GSS Introduction. This Groningen Graduate Schools (GSS) is the umbrella organization of all faculty based graduate schools at the university.

Every PhD student starting a degree program receives an invitation. It is a two-day event, offering a variety of activities, giving an impression of the University and its faculties and facilities, the city and province of Groningen, and a taste of courses and other support activities offered by the University of Groningen graduate schools.

1 EC
PhD Communities at the University of Groningen

There are two PhD associations in Groningen:

**GRIN** (Groningen Graduate Interest Network) which represents and supports the interests and rights of PhD students, and **Gopher** (Groningen Organization for PhD Education and Recreation) which organizes informative and social events.

**Websites:**
www.gopher.im
www.grin.im

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**PhD Council**

The PhD Council represents the interests of all PhD candidates within the GSMS. The council consists of two PhD students from each of the four research institutes.

GSMS: phdcouncilgsms@gmail.com

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**GSMS PhD Development Conference**

Every two years the GSMS PhD development conference is organized for all GSMS PhD students. The conference focuses on creating awareness of the value of a PhD, discovering specific PhD talents and how to transfer your talents to your further career. A two day program will cover several lectures, workshops, discussions and a career market.

More information: [http://www.gsmsconference.com](http://www.gsmsconference.com)
Study load: 1 EC

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**Degree Program Advisory Committees**

Each research institute has a degree program advisory committee that is responsible for the education program.

The GSMS Degree program advisory committee is the umbrella committee and consists of the chairs of the research institutes’ degree advisory committees and their PhD student representatives.

Further information can be obtained at the education coordinators of the institutes.

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**Principles of Scientific Integrity**

Code of Conduct for Scientific Integrity for courses organized by the Graduate School of Medical Sciences.
This document was drawn up at the request of the Degree Program Advisory Committee of the Graduate School of Medical Sciences (GSMS). The reason for drafting this document stems from the generally shared conviction that scientific education needs to be conducted in a proper way by all involved parties. In order to provide an indication of desired behavior, the following principles of scientific integrity have been established to promote the best scientific education.

- **Scrupulousness:** course participants have to take care that the data obtained by research is precise and nuanced and is not influenced by externalities.
- **Reliability:** course participants have to take care that their data acquisition, data processing and data reporting are honest and with true scientific motives.
- **Verifiability:** course participants have to take care that at all times it is clear where data and the conclusions are based on, where they were derived from and how they can be verified.
- **Impartiality:** students participate in a course with the intention to develop their academic knowledge and skills and use their full academic potential.

Independence: course participants are not influenced by interests other than those aimed at conducting pure science. Examples of non-desired dependencies are personal financial gain or pressure of publication.

Scientific misconduct, also named fraud or serious offense, is all behavior in contradiction with the above mentioned principles of scientific integrity in academic research. The RUG hereby declares that these behaviors are not accepted and need to be opposed. This could result in sanctions for involved parties. The authors of this document realize that participants of GSMS courses are in a learning situation. Therefore, not all conduct that opposes above mentioned principles can automatically be considered scientific fraud.

When a serious scientific misconduct is observed by one of the involved parties, this should be discussed with both involved parties and an independent third. The allegations will be researched and evaluated so that can be judged whether scientific fraud has occurred. Any confidential information will be handled with care at all times by all parties involved.

A result of arbitration by a third party or the Pro Dean of Education can be that a course participant has shown scientific misconduct and should be penalized. Possible penalties are, among other things, no allocation of the EC that stand for the concerned course, denying of any participation to a course organized by GSMS (for a certain period of time) and a mandatory participation to the GSMS course ‘Scientific Integrity’ for participants in courses. Furthermore, the supervisor of the student concerned will be informed. The verdict of the Pro Dean of Education is binding.

**Further information:**
www.rug.nl/education/phd-programme/general-information/regulationsforphd
Guidelines and Requirements for Approval of a PhD Thesis

As of September 2013 the protocol for the conferral of a PhD has been renewed. A detailed description can be found at: www.rug.nl/education/phd-programme/general-information/regulationsforphd

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 protocol mentioned above gives 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’ 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. Also, there are no specific requirements with regard to the number of (experimental) chapters nor the size (the number of pages) of the thesis. However, since the PhD title is given as ‘proof of being an independent researcher’, it is clear that the manuscript should show sufficient indications that the candidate has mastered the entire cycle associated with performing scientific work. This includes the writing and, preferably, publication of research papers. As a rule of thumb the UMCG considers a thesis containing an introduction / outline of the thesis, two published/accepted/acceptable experimental chapters and, preferably, two additional (experimental) chapters as appropriate. 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. More importantly, 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 conferral of a PhD as mentioned above. A ‘cum laude’ PhD defense is not a prerequisite, but may be very helpful in starting a scientific career, e.g. as (pre)tenure track fellow at the UMCG.
GSMS Courses

General Competences
Project Management and GSMS Introduction

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, including an introduction to the GSMS organization and procedures. This first day is the start of coaching and follow-up sessions in the 2nd and 3rd year of the PhD research project. The main topic of these follow-up sessions is the progress of the 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 in the course is valorization of knowledge where valorization means ensuring that knowledge which has been developed at the university is put to effective use, by translating it into economically productive activity, for example (but not only) through technology venturing.

In eight classes/workshops we will discuss principles and processes of entrepreneurship, potential of entrepreneurship as a career, and the specificity of valorization of medical innovations as they occur at the graduate school of medical sciences. Students in this course will develop and present a business case based on their own research project, or on another case.
Depending on the specific research subject (e.g. technical or not) this business case might be written in the form of an Technology Foundation STW Valorisation Grant Phase II Application or in an business model/plan format.

This course is also aiming at PhD students who are interested in developing an entrepreneurial attitude, a minimal requirement necessary for researchers these days. The core topics we deal with in this course are Valorization and Career, entrepreneurial opportunity discovery and evaluation, definition of the business model, and establishing a new venture. Two further topics: corporate and global entrepreneurship, will allow students see the new venture process from a different perspective.

The course consists of 8 sessions, each consisting of 2 lecture hours on Mondays and 3 Venture lab workshop sessions on Fridays.

The series of lectures and workshops discuss and practice the elements of the process of entrepreneurship. We follow the basic model of entrepreneurship in networks (a.o. Groen, 2005) and add to that a set of literature which allows students become aware of the core concepts and learn to work with them and apply them to the medical context during the workshops.

The workshops can be used to develop an idea based on own research, or to follow up on an existing case. Eventually it is also possible to study cases. The lectures aim at presenting the theory side of the course. Still, as we work in the context of engaged scholarship, we aim at presenting theoretical elements which can be instructive for understanding entrepreneurial developments. We, thus, teach to how to do such processes.

The course will be concluded with a group or individual plan of development of a medical sciences related valorization or entrepreneurial project.

- Review relevant academic literature and critically evaluate theories, concepts and methods underpinning entrepreneurship and valorization.
- Apply these insights on entrepreneurship in real business contexts related to medical & life sciences research.

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.

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

COORDINATOR
W.C.J. (Wim) Tommassen, MA

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.

- Level of proficiency in writing in English approaching C2
- Increased awareness of stylistic and editorial conventions of the field.

COORDINATOR
W.C.J. (Wim) Tommassen, MA

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Scientific Writing A-Z

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.

COORDINATOR

E.R. (Eliane) Popa, PhD

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The use of digital cameras, computers and accompanying imaging software (e.g. Photoshop, Paint Shop, Scion Image, etc.) have made the manipulation of images (such as microscope recordings, protein and DNA gels/blots, bio-scans) an indispensable aspect of today’s science. However, the steady technical advances in image acquisition and manipulation also raise important issues as to the limitations of these in generating representative and scientifically justifiable images for presentations and publications. During this workshop, the participants will explore the borderline between ‘data misrepresentation’ and ‘getting the most out of available technical possibilities’ and, in this way, explore the borderlines that separate honest error, negligent error, and scientific misconduct.

The workshop is one afternoon and has an informal structure. Following a word of welcome and introduction by Sven van IJzendoorn, PhD (Department of Cell Biology, UMCG), several cases (fictional and non-fictional) will be presented to provoke lively discussions. Frans van Hoesel, unit head of the Center for High-Performance Computing & Visualization (HPC&V), will speak about the technical details with regard to the possibilities and limitations of digital imaging techniques and software.

**LEARNING OUTCOMES**

- The student can name 4 examples of digital image handling that are not tolerated by top journals such as Nature, Science and Cell.
- The student can name 7 general guidelines / rules to which digital image handling must adhere according to top journals such as Nature, Science and Cell.
- The student can use the current guidelines / rules to distinguish between correct and incorrect digital image handling.

**COORDINATOR**

S.C.D. (Sven) van IJzendoorn, PhD

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**BCN Management Competences in your PhD Project**

*(Compulsory for BCN)*

The essential elements are:

- Working within a project structure
- Project assignment
- The ‘interplay of forces’ surrounding a project
- Timetabling
- Decision-making
- Managing a project
- Writing a project assignment

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• 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.

• Learn to work within a project structure as an effective method of scientific research that should result in a doctoral dissertation.

F.W. (Frans) Cornelissen, PhD

BCN Orientation course

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:**
Day 1. Cognition and Language
Day 2. Exercise
Day 3. Intelligence
Day 4. Organization of Behaviour
Day 5. Adaptation
Day 6. Emotion

• 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. D.G.M. (Domien) Beersma

**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. Within this group you are also expected to ask questions about posters of other participants.

**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. H.W.G.M. (Erik) Boddeke

**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.

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**LEARNING OUTCOMES**

- 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.

**COORDINATOR**

Prof. P.U. (Pieter) Dijkstra

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**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.

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

**COORDINATOR**

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

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**KEY FACTS**

- Intended for: PhD students
- Examination: Presentation
- EC: 1.5
- Language: English
Introducing New PhD Students to SHARE

The scientific director, the literature retrieval specialist and the PhD Council will explain their role in the Research Institute and give information on the organization of the Graduate School/Research Institutes within the UMCG and on the Educational Program for PhD students.

COORDINATOR
D.G. (Truus) van Ittersum

Science Writing Course

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. Students may be asked to complete assignments prior to the lectures. The students will also be expected to set up and manage citation alerts. 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 using e-mail or 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 make choices about journals to submit a paper to
• To write effective cover letters
• To cope with editors’ requests and reviewers’ comments
• To decide whether and how to appeal rejection of a manuscript
• To know the ethics in science and publishing (bias, self-plagiarism)
• To manage electronic sources like web of science (citation alert).

COORDINATOR
Prof. P.U. (Pieter) Dijkstra
Prof. J.C. (Jim) Coyne

KEY FACTS

Intended for PhD students
Examination Not Applicable
EC 0
Language English

KEY FACTS

Intended for PhD students, only clinical research
Examination Participation required
EC 2
Language English
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.

COORDINATOR: D.G. (Truus) van Ittersum

Ethics of Research on Human Subjects

Research involving human subjects must first be assessed in terms of medical ethics. Researchers can obtain approval to perform the research from a recognized review committee or, in certain cases, from the CCMO. The Central Committee on Research Involving Human Subjects or CCMO, oversees medical research involving human subjects in the Netherlands. The seminar seeks answers to the following questions: What is the reason for these requirements? Why is a medical ethical assessment required? Which medical ethical guidelines must be followed?

COORDINATOR: E.L.M. (Els) Maeckelberghe, PhD
GSMS Courses

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

CONTENT
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.J. (Remco) Renken, PhD

KEY FACTS
Intended for PhD students (prioritized), Research master students
Examination “Cookbook” report on analysis, presentations and practical work (compulsory)
EC 1.5
Language English

BCN Advanced fMRI Course
“From Voxels To Networks”

CONTENT
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 boost strapping 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.J. (Remco) Renken, PhD

KEY FACTS
Intended for PhD students and those interested
Examination Participation required
EC 1.5
Language English
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.

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

Prof. M.M. (Monicque) Lorist

BCN Matlab

Provide an overview of some of the features of MATLAB as a way to begin:
• Evaluation of this technical computing tool
• Training in the art of computer programming
• Learning to use MATLAB as a notepad for mathematical computations that arise in engineering and science courses.

• Learn how to examine, explore and evaluate MATLAB
• Learn how to do technical computing with MATLAB
• Learn how to design programs to solve technical problems via structure plan (i.e., a design methodology)
• Learn to formulate algorithms for the steps of the structure plan
• Learn how to translate the steps into computer programs to solve engineering and scientific problems.

H.G. (Helco) van Keeken, PhD
BCN Statistics Course

**CONTENT**

The topics treated are: introduction to statistical concepts and principles, analysis of variance, analysis of covariance, regression analysis, multilevel analysis, repeated measures analysis, non-parametric statistics, and logistic regression.

The objectives of this course are to refresh and augment your basic statistics knowledge. We aim at providing you with an overview of the relevant aspects in using statistics in the cognitive and behavioural sciences. This includes knowledge on the theory of statistical procedures, their aims, their interpretation and their application in practice.

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

**COORDINATOR**

E.M.L.A. (Edith) van Krimpen-Stoope, PhD

**KEY FACTS**

- Intended for: PhD students (BCN, preferably second year)
- Examination: Participation required
- EC: 2
- Language: English

Epidemiology and Applied Statistics

**CONTENT**

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, linear 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.

**KEY FACTS**

- Intended for: PhD students, senior or postdoc staff
- Examination: Presentation
- EC: 3
- Language: English
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.

Prof. H.M. (Marike) Boezen

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.

LEARNING OUTCOMES
• 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.

COORDINATOR Prof. H. (Harold) Snieder

CONTENT In this course the participants will learn about advanced principles of genetic (epidemiological) research with a focus on genome-wide association studies (GWAS), post-GWAS analysis and other advanced techniques and designs building on GWAS results. The relevant background will be explained during interactive theoretical lectures taught by experts.

The theoretically acquired knowledge will be applied in practical classes. The participant will get familiar with study design issues and the advanced statistical techniques that build on GWAS data and results such as Genetic Risk Score analyses and Mendelian randomization designs. Common (freely available) statistical programs to perform genetic data analysis will be used, such as PLINK, GCTA etc.

LEARNING OUTCOMES
• 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 advanced forms of genetic data analysis.

FREQUENCY Once a year in fall semester (October or November)

COORDINATOR Prof. H. (Harold) Snieder

KEY FACTS
Intended for Phd students and Master students. Some basic knowledge of genetics and statistics is recommended
Examination Participation required
EC tbd
Language English

3 full days: lectures from 9.00 – 12.00; computer practicals from 13.00 – 16.00
Data Integration for biologists

NGS techniques have become ubiquitous. These techniques produce massive amounts of data, and over the last decade a lot of biologists have been facing the same challenges with the big -omics data. What platform and what type of experiment to choose to answer biological questions? How to check the quality of the obtained data? What to do further with the data if you are not a bioinformatician? How to annotate, integrate and visualize your data? How to integrate the data from different experiment and to connect genome, transcriptome and proteome data?

A one week introductory course of the data analysis and integration for an -omics data. For the biologists who plan to explore and integrate various data domains. Examples in this course are related to ageing research and other areas of basic research in the Biology field.

Assumed pre-knowledge: A basic understanding of the molecular biology and genetics.

- Understand the need, benefits and challenges of data integration
- Understand the source of the data as well as the algorithms used for combining data
- Be familiar with the main repositories for -omics data
- Be able to retrieve the data from the repositories
- Know the best ways to manage and analyze the data.

COORDINATOR
V. (Victor) Guryev, PhD
M.R. (Marianna) Bevova, PhD

Good Research Practices: GCP/GLP

The course takes place during seven days from 9 a.m. to approximately 3 p.m. and is a mixture of lectures, site visits to a GCP-certified clinical research center and a GLP-certified laboratory, demonstrations, interactive video training and case studies (group presentations). Participation requires thorough preparation studying abstracts and literature, which will be provided before the start of the course, and doing active research of the subject on the Internet.

- General principles of quality management applied to drug research: Good Research Practices: GxPs
- Legal and ethical aspects of new drug development
- Good Clinical Practice (GCP) (ethical aspects: preparing, performing and evaluating a clinical study with a potential new medicine)
Methodology for Phase II/III Clinical Trials

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.

Course Information
The course is organized in three parts. The first part discusses general topics on conducting clinical trials, including the goals of the different phases of clinical trials, ethical and legal issues, and additionally information on clinical guidelines (i.e., all aspects of good clinical practice). This part of the course is in collaboration with the Trial Coordination Center. The second part focuses on statistical principles in developing a Phase II clinical trial. The single treatment designs of Fleming, Simon, and Gehan are discussed in detail and practiced with examples. Comparative designs for Phase II trials are presented next. This topic discusses the causal model of Rubin, the role of surrogate outcome measurements, and randomization principles. The third part is about Phase III trials. Trial designs like the parallel group design, cluster randomized designs, and cross-over designs, as single and as multi-center trials, are discussed in detail. Class-room exercises are provided to practice data analysis of these three clinical trials. Interim analysis, non-inferiority, and equivalence testing are also included in the course. Throughout the course, sample size calculation for Phase II and Phase III trials is a substantial part of the course.

Exercises and Assignments
Besides classroom exercises to practice some of the course material, the participants need to perform three assignments. The participants will work in groups of three or four people.
The assignments are:
• Write a proposal for a Phase II trial
• Analyze and report a Phase II trial
• Present a project plan for a Phase III trial

The assignments are based on a case study. A company would like to introduce a new drug eluting stent. In the introduction part of the course detailed information on stents is provided (coronary artery disease, stenosis, lumen late loss, technical details, guidelines, results of competitors, etc). The proposed Phase II trials in the first assignment are used to generate simulated data (using a statistical model that is based on real data) to be able to execute the second assignment. The analysis of the Phase II trial is reported by an abstract (background, method, results, conclusion) with title. The Phase III trial for the third assignment builds upon the results of the second assignment and should be presented to an audience that will act as a group of experts that should approve their proposal.

• Have general knowledge on Clinical Trials
• Have detailed knowledge on methodology issues in Phase II/III trials
• Develop different design Phase II/III trials (including sample size calculation)
• Analyze data from different trial designs (for continuous and binary outcomes)
• Write a Phase II protocol.

You are expected to work on this course activities full time during 2 weeks. Before the course starts you will receive some documents to study.

Course is 1x per year in March.

J.G.M. Burgerhof

Applied Longitudinal Data analysis

This course focuses on the application of several statistical techniques for the analysis of longitudinal data. On the first day we will start with discussing longitudinal study designs and the need for specific analysis techniques for longitudinal data. In addition, we will discuss basic techniques for longitudinal data analysis (repeated measures ANOVA and MANOVA for repeated measures). More flexible techniques, including multilevel analysis and GEE, will be discussed on the second, third and fourth day of the course. During these days we will discuss the analyses of continuous, dichotomous and categorical data. In addition, we will examine different possibilities for modeling changes. The course days consist of lectures in the morning and practicals in the afternoon. In the lectures, the several techniques will be illustrated with examples from health sciences. In the practicals, students will analyze data from several example datasets themselves using
SPSS. Students entering this course should have demonstrable knowledge of basic statistical concepts and techniques, including linear and logistic regression analyses and analysis of variance. Students with experience in longitudinal data analysis who are interested in statistical modeling of longitudinal or other types of clustered data are referred to the course “Mixed Models for Clustered Data”.

- Decide when to apply longitudinal data analysis techniques
- Choose suitable techniques for specific situations
- Perform basic longitudinal analyses
- Interpret results from these analyses.

M.R. (Michiel) de Boer, PhD

**Clinical Epidemiology**
*(Research Master CPE)*

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

**Course objectives:**

**Professional data management strategies:**
- The student is able to recognize how different data structures can influence results.
- The student is able to plan a professional data management strategy.

**Basic measures of Clinical Epidemiology:**
- The student can explain the meaning of the following measures: prevalence, cumulative incidence and incidence rate; absolute risk ratios and rate ratios, and hazards.
- The student can draw valid conclusions from the results of data analysis in Clinical Epidemiology.

**Diagnostics**
- The student should be able to discern between the following concepts: diagnostics and screening, reference or gold standard,
- The student should be able to interpret outcomes of calculations on: sensitivity, specificity, negative and positive predictive value, Bland and Altman plot, ROC, AUC.
- The student can describe the process of Medical Decision Making when applied in the evaluation of diagnostic agents.

**Prognostics:**
- The student knows how prognostic models are developed (logistic regression, OR, HR, variable selection), knows how prognostics models can be validated (internal and external validation), and is able to judge the performance of prognostic models (ROC curve, calibration, IDI, NRI).
b. The student applies SPSS to build and validate a prognostic model.

Designs for evaluation of interventions:

a. The student is able to appraise intervention and observational study designs in the evaluation of medical interventions.

Cost-effectiveness analysis:

a. The student is able to interpret the results from a cost effectiveness analysis, from a professional and societal level. The student understands the following designs and concepts: Cost-analysis, cost-effectiveness analysis, cost-utility analysis, QALY, Cost-effectiveness Plane, ICER, Acceptability curve

b. The student can describe how cost-effectiveness analysis can be applied to evaluate the impact of using a diagnostic or prognostic model in terms of patient outcomes and costs.

- To interpret and apply the basic measures of Clinical Epidemiology
- To use clinical epidemiological tools to answer a question on diagnostics
- To use clinical epidemiological tools to answer a question on prognostics
- To know and apply study designs for evaluation of interventions
- To know the several designs, interpret and apply a cost-effectiveness analysis
- To have knowledge on the basics of scientific integrity
- To develop professional data management strategies.

Prof. G.H. (Truuske) de Bock

**Clinical Relevance versus Statistical Significance**

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.

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

**KEY FACTS**

- Intended for: PhD students, Research Master Students
- Examination: Participation required
- EC: 1
- Language: English
Health Technology Assessment and Economic Evaluation
(Research Master CPE)

Objective: Students will learn to design, implement, and analyze health outcomes/cost-effectiveness studies, and critically review and use such research data for clinical decision making, health care planning, and policy making.

Description: The supply and demand curves are considered to illustrate the context of the value of (new) medical interventions. Theoretical aspects of economics of health care. Effect measures: clinical indicators, utilities, health-state values, QALYs. Instruments to measure the ‘quality of life’ effect: multi-attribute preference-based health classification systems. Economic variables: health profit, discounting, cost-effectiveness ratio. In the end the course integrates efficacy, effectiveness, safety, toxicity and cost-effectiveness.

Students will be introduced in the field of Health Technology Assessment (HTA) and the various approaches of HTA. Learn to identify the main problems addressed by an interventions and how to measure its effect.

- Evaluate an economic evaluation based on the Dutch guidelines for pharmacoeconomics
- Conduct a cost-effectiveness analyses based on discounting
- Acquire knowledge and understanding of different analytical methods used in cost-effectiveness analysis and the corresponding software packages.

COORDINATOR
Prof. M.J. (Maarten) Postma

KEY FACTS

Intended for: PhD students, Research master students 
Examination: Oral examination
EC: 3
Language: English

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.

KEY FACTS

Intended for: PhD students, Research master students 
Examination: Written examination
EC: 1.5
Language: English
Incomplete Information: Non-response, Attrition, and Missing Data

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.

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

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 with sample size (power) will be discussed. Statistical tools such as factor analysis and reliability assessment will be dealt with. Students will have to do several exercises: developing a questionnaire, creating scale-scores from an existing dataset, judging and investigating the structure of an existing questionnaire. Students will learn how to develop good measurement instruments, and how to judge existing instruments.

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

- 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
**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) that will be available from 2013. 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.

**COORDINATOR**

J.G.M. (Hans) Burgerhof, PhD

**KEY FACTS**

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**Mixed Models for Clustered Data**

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

**The content or topics of the course are:**
- Analysis of variance models (cross-sectional data)
- Linear mixed models (longitudinal data)
- Generalized linear models (cross-sectional data)
- Generalized linear mixed models (longitudinal data)
- Model selection approaches
- Missing data analysis.

All topics will be explained on the basis of real case studies from epidemiology and the clinic and the exercises will deal with real research questions. Focus will be given to the technical part of applying mixed models to give researchers flexibility to create their own mixed models for their research. An introduction to this topic is the course “Applied Longitudinal Data Analysis”.

**KEY FACTS**

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

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.

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

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**Psychiatric Epidemiology**

(Research Master CPE)

This course addresses the distinctive features of psychiatric epidemiology as compared to somatic disease epidemiology and the implications of these differences for the design, implementation and interpretation of research on mental disorders.

Important components of the course include: incidence, prevalence, clustering and natural history of mental disorders; social and economic consequences including work on disease burden; and – at an introductory level – major etiological models, including proximal and distal determinants. Students will be introduced to instruments and measures of psychiatric epidemiology such as CIDI, SCAN, Life History Chart and Personality.

**LEARNING OUTCOMES**

- To gain an overview of the directions and commonly used techniques in psychiatric research (e.g. genetics, psychosocial research, psychometrics)
- To become aware of the particular challenges to psychiatric research (e.g. diagnostic issues, incomplete etiological models)
- To get acquainted with advanced new statistical approaches in psychiatric research (e.g. latent variable modeling, time-series analyses and network modeling).

**COORDINATOR**
K.J. (Klaas) Wardenaar, PhD

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**KEY FACTS**

**Important Facts**

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**CONTENT**

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

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**CONTENT**

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**COORDINATOR**
K.J. (Klaas) Wardenaar, PhD

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Public Health Epidemiology  
*(Research Master CPE)*

This course covers the principles of epidemiologic research aiming to provide the evidence base for community-based screening, primary prevention and identification of risk factors.

Topics concern methods to estimate the burden of disease due to specific causes, to assess the potential effects of early treatment, and to examine the properties of community-based diagnostic tests. Associated measures are e.g., the population-attributable risk, and sensitivity, specificity and positive and negative predictive values. With respect to primary prevention, attention will be paid to the specific requirements for performing community-based interventions, e.g., the design of studies. Strategies for randomization such as individual and cluster-based randomization will be discussed and quasi-experimental studies will be introduced. As regards the analyses, attention will be paid to associated statistical methods such as ordinary regression and multilevel analyses. Finally, problems met in practical data collection and potential solutions will be provided as a hands-on start for research projects in public health. Practical exercises are embedded in the writing of a research proposal with contacting researchers in public and occupational health where needed.

At the end of the course the student is able to design a research protocol to assess effectiveness of preventive interventions or instruments and to identify risk factors in observational cohort studies.

- Knowledge of the broad concept of public health
- Able to define relevant public health issues by standardized measures
- Insight in preventive strategies aiming at the enhancement of populations’ health
- Insight in the use of epidemiological study designs in community-based (intervention) studies
- Insight in the use of a number of effect measures used in public health epidemiology.

Prof. U. (Ute) Bültmann  
Prof. S.A (Menno) Reijneveld

**KEY FACTS**

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**COORDINATOR**

Prof. U. (Ute) Bültmann  
Prof. S.A (Menno) Reijneveld
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.

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

COORDINATOR
Prof. R.P. (Ronald) Stolk

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.

The general teaching aim is to provide PhD students with knowledge and skills needed to perform a systematic review and meta-analysis, under the supervision of experienced researchers.

**CONTENT**

**LEARNING OUTCOMES**

**COORDINATOR**

**KEY FACTS**

Intended for  PhD students, Research master students
Examination  Written examination
EC’s  4
Language  English

Intended for  PhD students
Examination  100% participation required, no exam
EC  1
Language  English
The 3-day intensive course will include a mix of lectures and hands-on work in groups and computer practical’s. Senior staff will be involved as lecturers and tutors. Students will have to read articles prior to and during the course (evenings) corresponding to a total of 10 hours of student work.

LEARNING OUTCOMES

- Formulate a clear research question for a systematic review and understand their key motivations for doing the systematic review
- Specify the eligibility criteria for a systematic review
- Develop a search strategy for a systematic review
- Select an appropriate quality assessment tool
- Prepare and perform a quality appraisal and data extraction for a systematic review
- Able to discover publication bias
- Identify, describe quantify and discuss sources of heterogeneity among the studies in a systematic review
- Develop a statistical analysis plan for a systematic review including weighing quality in this process
- Able to perform a sensitivity analysis
- Conduct, report and update a systematic review
- Use this knowledge to assess the quality of systematic review performed by others

COORDINATOR

Prof. P.U. (Pieter) Dijkstra
Prof. U. (Ute) Bültmann

Working with Questionnaires in Patient-related Research

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. This course is a short version of the Research Master course ‘Measuring Concepts in Quantitative Research’ (in which PhD students can also participate).

COORDINATOR

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

KEY FACTS

- Intended for: PhD students, Research master students
- Examination: Participation required
- EC: 1
- Language: English
Cellular Imaging - Basic

Topics include theoretical aspects and hands-on demonstrations of fluorescence microscopy, electron microscopy, probes, live-cell imaging, data acquisition and analysis. The opportunities of implementation of advanced microscopy in the participant’s own PhD-project will be discussed. Given the hands-on demonstrations and the focus on practical implementation, the group-size is limited.

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

In Vivo Optical Imaging Analysis

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.

### Microscopy

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.

T.G. (Theo) van Kooten, PhD

### Quartz Crystal Microbalance (QCM) and Low Load Mechanical Tester (LLMT)

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**

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

**CONTENT**

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.

T.G. (Theo) van Kooten, PhD

### Laboratory Animal Science

**CONTENT**

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.

**Microbiological Safety**

The course covers the following topics:
general manual skills and techniques relevant to the isolation of (potentially) pathogenic micro-organisms; extinction rate of bacteria outside a culture; disinfection and sterilization; escape by contamination and aerosols; checking for cleanliness; working in a safety cabinet; and applying for a permit for genetic modification. Some theoretical background will be provided as well as a summary of Dutch legislation on genetic modification. Module ML-I of the UMCG e-learning “Working with Biological Agents” is part of the course.

**LEARNING OUTCOMES**
• Able to safely handle micro-organisms using basic microbiological techniques
• Knowledge of the safety measures for working at level ML-I.

**COORDINATOR**
B.L. (Barry-Lee) Waarts, PhD

**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).

**COORDINATOR**
C. (Caroline) Roozendaal, PhD
GSMS Courses

Field Specific & Inter-disciplinary Subjects
The last two decades have seen an explosion of research within and related to the neuro-sciences. 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 Wittgensteinean 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

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.
• The student has a good regional and functional knowledge of the majority of brain structures, and the entire human central nervous system
• The student is able to communicate about neuroanatomy with health-care and research professionals.

CONTENT 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, siRNA 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

COORDINATOR Prof. G. (Ingrid) Molema
High-throughput next-generation biology

It is becoming clear that with the advent of high-throughput technologies, such as DNA and RNA microarrays and especially next-generation sequencing, large amounts of “omics”-data are now publicly available and can also now be generated at limited cost.

Taking advantage of this data is still challenging, as it is difficult to analyze large amounts of data, and it is often unclear what kind of biological insights can be gained from this data.

This course aims to provide an overview of existing high-throughput technologies on DNA, RNA, and methylation. We will discuss ways to set-up proper experiments, bioinformatics methods to analyze this data, ways to integrate different technologies, and most importantly what biological insights can be gained from such analyses.

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

COORDINATOR

M.A. (Morris) Swertz, PhD
L. (Lude) Franke, PhD

Membranes, Signal Transduction and Transport

Recent concepts of mechanisms of membrane transport—both trans-membrane transport and membrane-vesicle-mediated transport—will be discussed, as well as signal transduction pathways originating at membranes. The course focuses on the level of cell biology in physiological and/or pathophysiological conditions but also includes transport and signaling studies at the level of the organism.

Topics will include:

- The structure, biogenesis, and dynamics of biological membranes
- Mechanisms of membrane transport
- Mechanisms of signaling pathways by way of membranes
- Analytical and image processing techniques.

- Understanding of major principles in the fields of biological membranes, membrane transport and signal transduction
- Insight into recent developments of specialized areas in these fields
- Ability to analyze the development in a specialized area in one of these fields and present the outcome (powerpoint)
Understanding of how the course may contribute to (new insights in) your own PhD project.

J.W. (Jan Willem) Kok, PhD

### 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.

Prof. N.C.(Nico) van de Merbel

### Course: 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.

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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 E-mail 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.

M.G.L. (Marja) Brinker, PhD

### Evolutionary Medicine

“Nothing in Biology makes sense, except in the light of Evolution” – Dobzhansky (1973)

“Nothing in Medicine makes sense, except in the light of Biology and thus in the light of Evolution

Humans evolved from the same lineage as great apes, yet today we show very different behavior. In this course we will try to understand behavior and health problems of modern humans from an evolutionary perspective, trying to get insight in the ultimate causes of health and disease. We will discuss questions like “Why do we crave unhealthy foods?”, “Why hasn’t natural selection eliminated traits that make us depressed?” and “Why do some of us have their first child in their teens, whereas others put it off until their late thirties?”

The course will start with an introduction into the mechanisms of evolution. Thereafter, we will discuss the topics of defence, reproduction, diet, and social behavior. We will use the book ‘Principles of Evolutionary Medicine’ by Gluckman, Beedle and Hanson (2009), supplemented by contemporary theoretical and research articles. Prof. dr. Frans Kroese, dr. Torsten Plosch, prof. dr. Frits Muskiet en prof. dr. Ton Groothuis are invited to answer in depth questions about their fields of research (defence, reproduction, diet and social behavior respectively). Course participants are asked to actively prepare for the meetings, by reading the chapters and articles and formulating one clarifying question and one in depth question about each.

### KEY FACTS

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<th>Intended for</th>
<th>PhD students</th>
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<td>Examination</td>
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<td>Language</td>
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Literature: Principles of Evolutionary Medicine by Gluckman, Beedle and Hanson (2009)

E. (Esther) Nederhof, 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. Students are invited to give a lecture on a topic of their choice within the areas covered in the course.

The course can be combined with patient presentations given in the context of the IBMG curriculum.

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).

H. (Henk) Groen, PhD

Basics in Psychology and Psychosocial Factors
(Research Master CPE)

The course gives an overview of major issues and theories of psychology: methods of psychology (research, diagnostics), processes of learning, explanations of behavior (genetic, cultural, cognitive), stress, motivation and emotions, personality and social cognition, social influence, memory and intelligence, cognitive and social development, abnormal behavior and treatment of psychological disorders.

- A major part of the course comes down to self-tuition. It is highly recommended to use the online student center accompanying the book.
- During the interactive meetings with one of the course teachers, students will discuss main topics of the book and recent empirical papers, based on assignments and presentations by students.

**KEY FACTS**

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**KEY FACTS**

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<tr>
<th>Intended for</th>
<th>Research master students, PhD students (when this course is followed up by a course for which basic knowledge of psychology is required)</th>
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LEARNING OUTCOMES

- Students will be able to describe and explain key concepts and theories of psychology
- Students will be able to apply this knowledge when examining specific psychological research questions
- Students will be able to write a brief scientific paper integrating theoretical knowledge and empirical research.

COORDINATOR

Prof. A.V. (Adelita) Ranchor

Drug Utilization Research

Contents will cover:

- Patient, provider and organization level determinants of drug use
- Inappropriate prescribing, guideline adherence and benchmarking
- Determinants and outcomes of complex drug use patterns
- Objective and subjective measurement of various types of medication adherence
- Drug choice models and shared decision making
- Benefit/risk evaluation, implementation of evidence-based practice
- Communication about drugs and safety issues, evaluation of policy measures.

Each theme will start with a general introduction on relevant theories, models and/or determinants, followed by an overview of possible or commonly used research methods and designs. Students will receive background reading and assignments to address relevant aspects on the use and interpretation of possible data sources, instruments, scales.

- To provide knowledge and insight in the concepts and methods used in drug utilization research
- To develop and improve ability and skills for applying this knowledge in a research project.

COORDINATOR

P. (Petra) Denig, PhD

KEY FACTS

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<th>Intended for</th>
<th>PhD students, Research master students, Master Students within the Medical Pharmaceutical Sciences programme</th>
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66
Health Psychology: Theory, Research and Practice
*(Research Master CPE)*

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

**Attention will be paid to the following themes:**
- Health behaviour change
- Psychological factors in the onset of illness
- Adjustment to chronic illness and interventions
- The health care context
- Life span development.

- Knowledge of basic health psychology theories
- Knowledge of health psychology research and its applications
- Critical appraisal of health psychology literature

**COORDINATOR**
Prof. A.V. (Adelita) Ranchor

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**Health Psychology; advanced course**
*(Research Master CPE)*

**CONTENT**
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.

- More insight in the most recent developments in Health Psychology
- Improvements in theoretical reasoning and analytic skills
- Improvement of writing skills.

Prof. M. (Mariët) Hagedoorn

Modeling 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.

- Ability to critically review model-based economic evaluations and results
- Ability to develop and program a (simple) health economic decision model
- Ability to use a health economic decision model for performing cost-effectiveness analysis and interpret the outcomes
- Ability to undertake relevant validation and sensitivity checks.

T.L. (Talitha) Feenstra, PhD

KEY FACTS

| Intended for | PhD students, Research master students |
| Examination | Assignment and oral presentation |
| EC | 1.5 |
| Language | English |
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; clotting assays; platelet functionality; antibody-binding studies; and fluorometric and luminometric methods).

T.G. (Theo) van Kooten, PhD

Cells, Materials & Biomaterials

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

KEY FACTS

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

Hydrophobicity-SFE-DLVO

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.

P.K. (Prashant) Sharma, PhD

Implants for Application in Maxillofacial Surgery

Maxillofacial surgery has been performed in the Department of Oral and Maxillofacial Surgery for many years. The use of biomaterials is an intrinsic part of the research program MON-1: Implants for application in maxillofacial surgery. Research is focused on biodegradable osteosyntheses and dental implants. Osteosyntheses should consist of biodegradable, biocompatible polymers with a high tensile strength, elasticity modulus and impact resilience. Instrumentation for handling the polymers and methods for sterilization and packaging are also being developed. Dental implants are being developed to restore the dentition of edentulous patients. Often it is necessary to reconstruct the resorbed mandible and maxilla by increasing the amount of bone before implants can be inserted. Besides the practical problems that are encountered, a number of considerations are taken
into account: clinical and psychological implications, cost effectiveness, forces associated with chewing, and even radiation effects from oncology treatment in the head-neck area.

T.G. (Theo) van Kooten, PhD

**Implants for Application in Ophthalmology**

Ophthalmic biomaterials are among the most widely used in-vivo materials in the world. More than 85 million people worldwide wear contact lenses. In the United States alone, another 5 million intraocular lenses (IOLs) made of silicones, acrylates, methacrylates, or combinations thereof, are implanted during cataract surgery every year. These operations additionally involve viscoelastic agents such as hyaluronic acid and hydroxymethyl cellulose. Many other devices are being used or investigated for potential use in the eye. The success rate of especially IOLs and contact lenses is high, yet further advancement is required. In this course, an overview of ophthalmic material applications will be given together with an outlook on the (near) future of this research field. A demonstration about current research will also be given.

T.G. (Theo) van Kooten, PhD

**Introduction to Medical Product Design**

Medical products are becoming more and more important for the treatment of patients. Medical products are used for diagnosis (MRI, X-ray, sonography, thermometers), surgery (surgical instruments, anesthesia), support of organs function (orthoses, glasses, hearing aids, pacemakers) and replacement of organs (hip and knee endoprostheses, artificial hearts). Many medical products have been developed by clinicians. Nowadays, most products are much more complex and thus require a multi-disciplinary research team to develop them. A methodological approach of the design process ensures that all relevant aspects are covered and that the design process can be controlled in terms of working hours, money and transit time. This ensures that: a good overview of all make good decisions; and the chance of realizing the best design is improved. An extra advantage is that it is possible to teach and study such a design methodology. In this course, an overview of all steps of the design methodology will be given as well as examples of applications. Assignments will be given to practice the theory. The course is a single afternoon session with lectures and practical work.

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

Tissue Engineering – An Introduction

Tissue engineering is a relative new field of research aiming at repair of damaged tissues or organs. To achieve this purpose cells are cultured in a laboratory, then combined with a biomaterial with or without growth factors to produce a specific tissue. Matters such as the choice of cells – either tissue specific cells (differentiated cells) or stem cells (undifferentiated cells) – the consequences of the interactions of cells with biomaterials, the structure of the biomaterial and the cell survival after implantation, will be addressed. On the basis of scientific articles specific issues will be discussed in small groups to be presented in a final plenary session.

T.G. (Theo) van Kooten, PhD

Immunology I

The course presents a rather detailed insight into the organs and elementary cellular and molecular processes of the immune system.

M.C. (Martijn) Nawijn, 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.

Coordinator: Prof. H.W.G.M. (Erik) Boddeke

**KEY FACTS**
- Intended for: PhD students, Research master students, those interested
- EC: 0.25
- Language: English

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. Furthermore, they will be asked to formulate a question or statement they wish to discuss with the scientist involved before attending the class.

Coordinator: Prof. H.W.G.M. (Erik) Boddeke

**KEY FACTS**
- Intended for: PhD students
- EC: 0.5
- Language: English

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 15-minute presentation on their project, followed by a 5-minute discussion. All participants are expected to be actively involved in the discussions following the presentations. Several senior staff members will be present to join in the discussions. Two senior staff members will provide feedback to the speakers.

Members will be present to join in the discussions. 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
• Answer questions about your research in a clear and concise way
• Ask questions about other researchers’ presentations.

Prof. H.W.G.M. (Erik) Boddeke

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.

COORDINATOR Prof. H.W.G.M. (Erik) Boddeke

SHARE Seminar Series

SHARE organizes lectures with national and international speakers on topics related to healthy ageing and health care.

COORDINATOR Prof. U. (Ute) Bültmann

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.

COORDINATOR Prof. M.H. (Marten) Hofker
External Courses
Basic Course Instructions & Organisation for Clinical Researchers

The GSMS will reimburse the costs to registered PhD students.

UMCG/Education Center

Detailed information:
www.wenckebachinstituut.nl

Career Development & Training

The Center for Career Development & Training offers training courses in the fields of grant applications, leadership, general skills and career development.

RUG/Broerstraat 5, building 13

Detailed information:
www.rug.nl/medewerkers/voorzieningen/Dienstenmobiliteitenopleiding/cursussenMenO/loopbaanOntwikkeling/loopbaanOrientatiePromovendi

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

Information Technology

Courses on information technology can be taken at the University of Groningen’s Donald Smits Center for Information Technology.

RUG/Zernikeborg

Detailed information:
www.rug.nl/cit/index
Contact and Addresses
## Research Institutes Contact Details

<table>
<thead>
<tr>
<th>Institute</th>
<th>Name</th>
<th>Contact Information</th>
</tr>
</thead>
</table>
| GSMS      | M.H. (Maaike) Bansema | Tel. +31 (0)50 363 8409  
|           |                       | E-mail: m.h.bansema@umcg.nl                 |
| CRCG      | D.H. Koopmans         | Tel. +31 (0)50 363 7817  
|           |                       | E-mail: d.h.koopmans@umcg.nl                |
| BCN       | M.H. (Maaike) Bansema | Tel. +31 (0)50 363 8409  
|           |                       | E-mail: m.h.bansema@umcg.nl                |
| CRCG      | M.H. (Maaike) Bansema | Tel. +31 (0)50 363 8409  
|           |                       | E-mail: m.h.bansema@umcg.nl                |
| GUIDE     | M.H. (Maaike) Bansema | Tel. +31 (0)50 363 8409  
|           |                       | E-mail: m.h.bansema@umcg.nl                |
| W.J. Kolff| T.G. (Theo) van Kooten| Tel. +31 (0)50 363 3122/3140  
|           |                       | E-mail: t.g.van.kooten@umcg.nl              |
| SHARE     | R.C. (Renate) Kroese  | Tel. +31 (0)50 363 7482  
|           |                       | E-mail: r.c.kroese@umcg.nl                 |

Online course info and registration: [www.rug.nl/gsms](http://www.rug.nl/gsms)
Faculty of Medical Sciences
Graduate School of Medical Sciences
PhD Study guide

3rd edition

General & Course information