Cardiovascular Research

Vrije Universiteit Amsterdam - VUmc - M Cardiovascular Research - 2016-2017

This study guide contains information on the Master Cardiovascular Research programme organised by the VUmc School of Medical Sciences for the academic year 2017-2018. All information about admission, programme components, planning and student facilities are available on the faculty website.

Aim

Every day, more than 100 people die of cardiovascular diseases in the Netherlands. In order to reduce this number of casualties, more scientific research focusing on the pathophysiology and treatment of cardiovascular disease is needed. The Master Cardiovascular Research aims to train (Bio)medically-oriented Bachelors and related Bachelors in Life Sciences to become Masters with in depth knowledge, attitudes and skills in the field of cardiovascular research. Cardiovascular research is interdisciplinary by nature and flourishes by the collaboration between clinicals, clinical researchers and basic scientists. This interdisciplinary and translational approach is a key element of our programme.

VU University Medical Centre has identified cardiovascular research as one of its core research areas. This programme forms the perfect start for a career in cardiovascular research. Teaching within the Master Cardiovascular Research programme is provided by staff members of the Amsterdam Cardiovascular Sciences (ACS) Institute.

Structure

The VUmc School of Medical Sciences coordinates all educational activities. The Programme Director and Master Coordinator of the Master Cardiovascular Research take care of the organisation and gearing of the curriculum. The Master Cardiovascular Research has a Programme Committee, an Examination Board and an Admission Board. The Programme Committee advises the executive board of the VUmc, the Director of the VUmc School of Medical Sciences and the Programme Director about the content of the Master programme and the quality of execution. The Examination Board (EC ECRO) decrees norms concerning admission of students, and makes sure that Bachelors comply with the requirements for admission. EC ECRO further decrees the terms concerning examination of different disciplines and overlooks the results of examinations, internships and theses. Furthermore, the Examination Board evaluates the combinations of optional courses and internships of each individual student. The Admission Board is responsible for the execution of the Cardiovascular Research entry assessment and the selection of the applicants during the admission procedure. All compulsory and optional courses are coordinated by different Course Coordinators.

Compulsory courses

All students of the Master Cardiovascular Research must attend the compulsory courses of the programme.

Optional courses

Students require consent of the Examination Board EC ECRO, if they want to attend an optional course. Courses attended without the consent of the Examination Board will not be registered. Possible financial consequences will be recovered from the student. Approval can be requested via a digital approval form, which can be found on the faculty website. For registration of optional courses students can use VUnet. If registration is not possible by using VUnet (e.g. external courses), the mode of inscription and corresponding e-mail addresses are indicated in each course description. Students are motivated to look for optional courses outside VUmc or VU University.

Research projects

The Examination Board EC ECRO has to approve both the Minor Internship and Major Internship, as well as the Literature Study. Approval can be requested via a digital approval form, which can be found on the faculty website. Unapproved Internship or Literature Study periods will not be registered by the educational secretarial office. Possible financial consequences will be recovered from the student.

External students

If a particular compulsory course can have more participants, students of other Master programmes from the VU can attend the course, providing that they meet the entry requirements. A written request for participation needs to be done in advance with the Cardiovascular Research Admission Board including a CV, a motivation letter, a reference letter and a recent transcript. Without permission of the Cardiovascular Research Admission Board and the Examination Board of the main study programme non-Cardiovascular Research students are not accepted in class.

Contact

General information about organisation, education, research and patient care within VUmc can be found on the VUmc website.

Programme Coordinator
Telephone: 020-4446345
Email:cvrmaster@vumc.nl

Student Service Centre (SSC)
Students can turn to the Student Service Centre with general questions about registration for courses and examinations, registration of grades, schedules and graduation.

Address:

VUmc School of Medical Sciences
Ground floor (behind the cafeteria)
Van der Boechorststraat 7
1081 BT Amsterdam
studentenbalie@vumc.nl

Inhoudsopgave

Master Cardiovascular Research - Optional Courses

The optional courses are intended to deepen the knowledge acquired in the compulsory courses. These options cover both theoretical and practical aspects of cardiovascular and biomedical research. Your choice of courses will depend on your own interests and the focus of your practical training. In principle you will be given the greatest possible freedom to choose, however the board of examiners has to approve your choice. We encourage students to find optional courses outside our own institution.

Below you find the link to the optional courses organised by the VUmc School of Medical Sciences. Via this link http://www.med.vu.nl/en/Images/Optional_courses_onco_tcm237-825974.pdf you find a list of all optional courses followed by students in previous years, including courses at other faculties and institutions.

Vakken:

Naam	Periode	Credits	Code
Academic Teaching and Presenting	Periode 3+4	3.0	M_CACTP09
Advanced Molecular Immunology and Cell Biology	Periode 1	6.0	AM_470656
Biobusiness Course	Periode 3+4	3.0	M_OBIOBUS10
Containment Strategies of Infectious Diseases in Global Context	Periode 1	6.0	AM_470127
Developmental Biology	Periode 2	6.0	AM_470613
Ethics in Life Sciences	Periode 3	3.0	AM_470707
Genomes and Gene Expression	Periode 1	6.0	AM_470614
Life Cell Imaging	Periode 3+4+5	3.0	M_CLIFECE09
Proteomics in Biomedical Research	Ac. Jaar (september), Periode 3+4+5	3.0	M_CPROTBI09
Radiation Protection Course, Level 5B	Ac. Jaar (september)	3.0	M_CRADPRO09

Master Cardiovascular Research - Compulsory Courses

The first semester of the programme consists of compulsory courses that provide you the basic knowledge about the main themes in cardiovascular anatomy, physiology, pathology, treatment options and science. The last two courses will support you to improve your academic skills. Master Cardiovascular Research students need to positively conclude at least three out of the first four compulsory courses to start their Minor Internship or Literature Study.

Opleidingsdelen:

- Academic Core Cardiovascular

Vakken:

Naam	Periode	Credits	Code
Biostatistics	Periode 3	3.0	M_FBIOSTA16
Cardiac disease	Periode 1	6.0	M_CCDMDT16
Diabetes and vascular disease	Periode 2	6.0	M_CDVDMDT16
From advanced imaging to stemcells	Periode 2	6.0	M_CFAISC16
Heart and circulation:basic principles	Periode 1	6.0	M_CHCBP16
Writing Scientific English	Periode 3	3.0	M_FWSE09

Academic Core Cardiovascular

Vakken:

Naam	Periode	Credits	Code
Academic Core Cardiovascular 1st year	Ac. Jaar (september)	0.0	M_CACCOREA14
Academic Core Cardiovascular 2nd year	Ac. Jaar (september)	3.0	M_CACCOREB14

Master Cardiovascular Research - Internships

In total, a student has to spend 66 EC for two Internships: a Minor Internship (30 EC) and a Major Internship (36 EC). Both Internships have to be performed at a research laboratory or clinical research group acknowledged by the Examination Board of the Master Cardiovascular Research. The Minor Internship may be any (bio)medical topic related to Cardiovascular Research and has to be performed at one of the departments of the VU/VUmc, AMC or Sanquin. The Major Internship must have a cardiovascular character and should preferentially be performed outside the VU or abroad. Each Internship needs to be approved in advance by the Examination Board.

The Master thesis includes the results of the Major Internship, integrated with and from the perspective of the knowledge acquired in the compulsory education. The Master thesis will get a uniform cover provided and designed by the Master programme.

All regulations regarding Internships and required forms can be found on the faculty website (www.med.vu.nl).These regulations apply to all students, which started the Master Cardiovascular Research in 2016 or later.

Vakken:

Naam	Periode	Credits	Code
Major Internship	Ac. Jaar (september)	36.0	M_CMAJORI16
Minor Internship	Ac. Jaar (september)	30.0	M_CMINORI16

Master Cardiovascular Research - Study of Literature

The Literature Study will be carried out under supervision, but in this stage of the education it is expected that the student acts highly independent. It is also possible that the student proposes his/her own subject and presents an own question. The study may be focused on a scientific (bio)medical question, but a more applied or social question is also allowed. The literature objective may be related to the Major Internship. The aim of the Literature Study is that the student will be able to select, evaluate and critically discuss relevant literature. Based on the literature analysis, the student has to clearly explain not only the state-of-the-art, but also the limitations and problems in the literature. Depending on the context of the study, the student has to formulate recommendations and strategies for further research to solve remaining problems. The Literature Study is written in the format of a review paper. It might be advised to use the concept of a systematic review.

All regulations regarding the Literature Study and required forms can be found on the faculty website (www.med.vu.nl). These regulations apply to all students, which started the Master Cardiovascular Research in 2016 or later.

Vakken:

Naam	Periode	Credits	Code
Literature Study	Ac. Jaar (september)	9.0	M_CLITSTU16

Academic Core Cardiovascular 1st year

Vakcode	M_CACCOREA14 ()
Periode	Ac. Jaar (september)
Credits	0.0
Voertaal	Engels
Faculteit	VUmc
Coördinator	dr. C. Boer
Examinator	dr. C. Boer
Lesmethode(n)	Werkcollege
Niveau	400

Doel vak
This course is designed to prepare you for your transition from student to scientist, the course spreads out and is part of the 2 year master programme.

Inhoud vak
The course consists of 4 modules: being a scientist during which the students are introduced to their mentor and to science in the field of

cardiovascular research. The second module provides the student with skills essential in research. During the third module the relation between research and society is emphazised this includes scientific conduct, research ethics and professional behaviour, In the final module you will learn how to write a job application letter, CV, prepare for an interview and more importantly define what you want as a professional career.

Onderwijsvorm
Interactive lectures and assignments

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

Academic Core Cardiovascular 2nd year

Vakcode	M_CACCOREB14 ()
Periode	Ac. Jaar (september)
Credits	3.0
Voertaal	Engels
Faculteit	VUmc
Coördinator	dr. C. Boer
Examinator	dr. C. Boer
Lesmethode(n)	Werkcollege
Niveau	500

Academic Teaching and Presenting

Vakcode	M_CACTP09 ()
Periode	Periode 3+4
Credits	3.0
Voertaal	Engels
Faculteit	VUmc
Coördinator	dr. J.M.H. Swennen
Examinator	dr. J.M.H. Swennen
Lesmethode(n)	Werkgroep, Hoorcollege
Niveau	500

Inhoud vak
During the course you will study theory about how to teach your (future) students as a university teacher and about how to present in an effective and attractive way. You will experience the presentations and lectures of both the course lecturer and your fellow students and learn from their lectures and presentations by reflecting on them.

Being a good teacher and presenter, however, cannot be learned by

reading literature or observing others. It is necessary to practice teaching and presenting yourself and to combine theory with practice. Learning from theory, learning from observation and learning from your own practice require that you are able and willing to reflect critically
• on theory: What is useful for me?
• on the practice of self and others: What can I learn from my observations? Am I able to practice this myself?
• on your own practice: What went well? What can I improve?

Advanced Molecular Immunology and Cell Biology

Vakcode	AM_470656 ()
Periode	Periode 1
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	prof. dr. R.E. Mebius
Examinator	prof. dr. R.E. Mebius
Docent(en)	drs. K. Brouwer, prof. dr. R.E. Mebius, prof. dr. Y. van Kooyk, dr. T. van der Pouw Kraan, prof. dr. H.E. de Vries, dr. ing. S.J. van Vliet, dr. R.M. Reijmers
Lesmethode(n)	Hoorcollege, Werkgroep
Niveau	500

Doel vak
To acquire insight into:
• cellular interactions within the immune system and how molecular diversity is generated to regulate immune responses.
• the various strategies of host immune responses against pathogens, and how pathogens escape proper immune responses.
• the various strategies of the host to positively or negatively affect immune responses during cancer.
• mechanisms by which the immune system regulates either immune activation or tolerance induction.
• the mechanism of cell migration within the immune system.
End terms:
Knowledge: Knowledge: At the end of the course the student is familiar with current knowledge on the (molecular) pathways involved in the induction and regulation of immune responses in health and disease.
Skills:
- The student is capable of applying the acquired knowledge and can interpret scientific literature and scientific hypotheses of each of the topics described above.
- The student is able to formulate a scientific hypothesis and can design a research proposal addressing the hypothesis.
- The student is able to present and discuss the research proposal with peers.

Inhoud vak
Immunology is a rapid growing field of research in medicine and attracts a lot of attention for its contribution in various diseases such as infection diseases, cancer and auto-immunity. The course will give the student the opportunity to enhance the knowledge on the scientific aspects within the field of immunology. Special focus lies on the immunological processes underlying homeostasis control i.e., tolerance

induction, immunity, antigen presentation and processes that lead to the development of inflammatory diseases (infection diseases through pathogens), auto-immunity (neuro-immunology) and cancer. Because this is an advanced course in the field of immunology, and will go into depth, particular on molecular details, students should be familiar with basic immunology preferably via a previous basic training course in immunology.

Onderwijsvorm
The course covers immunological processes at the molecular level, and consists of lectures (H; 22 hours) and study groups (W; 14 hours). In the latter part students will
read review articles as well as primary scientific articles on the subjects and discuss in groups opposing views on the molecular immunological processes that occur in the different stages of homeostasis and disease control. State of the art will be discussed of all topics, which will facilitate the study of scientific articles.
Additionally, there is time for self study as well as time to design a research proposal (pro; 4 hours), which will be presented. The first three weeks
include lectures, study groups, self study and preparation and presentation of the research proposal, whereas the last week mainly covers self study and the exam.
Contact hours with teachers and/ or coordinators: 40

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

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

Titles reviews and scientific papers (some changes may occur, final list will be posted on BB)
Reviews
1. Rossi M, Young JW. Human dendritic cells: potent antigen-presenting cells at the crossroads of innate and adaptive immunity. J Immunol. 2005 Aug 1;175(3):1373-81.
2. Sallusto F, Mackay CR. Chemoattractants and their receptors in homeostasis and inflammation. Curr Opin Immunol. 2004 Dec;16(6):724-31.
3. Kumar H, Kawai T, Akira S. Pathogen recognition by the innate immune system. Int Rev Immunol. 2011 Feb;30(1):16-34.
4. van de Pavert SA, Mebius RE. New insights into the development of lymphoid tissues. Nat Rev Immunol. 2010 Sep;10(9):664-74.
5. De Libero G et al., How the immune system detects lipid antigens. Prog Lipid Res. 2010 Apr;49(2):120-7. doi: 10.1016/j.plipres.2009.10.002. Epub 2009 Oct 24.
6. Surana NK, Kasper DL., The yin yang of bacterial polysaccharides: lessons learned from B. fragilis PSA. Immunol Rev. 2012 Jan;245(1):13-26.
7. Abbott NJ, Rönnbäck L, Hansson E. Astrocyte-endothelial interactions at the blood-brain barrier. Nat Rev Neurosci. 2006 Jan;7 (1):41-53.
8. Bevan MJ. Helping the CD8(+) T-cell response. Nat Rev Immunol.

2004 Aug;4(8):595-602.
9. Drew M. Pardoll. The blockade of immune checkpoints in cancer immunotherapy. Nature Reviews Cancer 12, 252-264 (2012)
10. Hansson GK, Libby P. The immune response in atherosclerosis: a double-edged sword. Nat Rev Immunol. 2006 Jul;6(7):508-19.
11. Schirmer SH, van Nooijen FC, Piek JJ, van Royen N. Stimulation of collateral artery growth: travelling further down the road to clinical application. Heart. 2009 Mar;95(3):191-7.

Research articles
1. Marsland BJ, Bättig P, Bauer M, Ruedl C, Lässing U, Beerli RR, Dietmeier K, Ivanova L, Pfister T, Vogt L, Nakano H, Nembrini C, Saudan P, Kopf M, Bachmann MF. CCL19 and CCL21 induce a potent proinflammatory differentiation program in licensed dendritic cells.
2. Joffre OP, Sancho D, Zelenay S, Keller AM, Reis e Sousa C. Efficient and versatile manipulation of the peripheral CD4+ T-cell compartment by antigen targeting to DNGR-1/CLEC9A. Eur J Immunol. 2010 May;40(5):1255-65.
3. Rangel-Moreno J, Carragher DM, de la Luz Garcia-Hernandez M, Hwang JY, Kusser K, Hartson L, Kolls JK, Khader SA, Randall TD. The development of inducible bronchus-associated lymphoid tissue depends on IL-17. Nat Immunol. 2011 Jun 12;12(7):639-46.
4. Reboldi A. et al., C-C chemokine receptor 6–regulated entry of TH-17 cells into the CNS through the choroid plexus is required for the initiation of EAE. Nat Immunol. 2009 May;10(5):514-23. doi: 10.1038/ni.1716. Epub 2009 Mar 22.
5. Feau S, Arens R, Togher S, Schoenberger SP. Autocrine IL-2 is required for secondary population expansion of CD8(+) memory T cells. Nat Immunol. 2011 Jul 31;12(9):908-13.
6. Sierra JR, Corso S, Caione L, Cepero V, Conrotto P, Cignetti A, Piacibello W, Kumanogoh A, Kikutani H, Comoglio PM, Tamagnone L, Giordano S. Tumor angiogenesis and progression are enhanced by Sema4D produced by tumor-associated macrophages. J Exp Med. 2008 Jul 7;205 (7):1673-85.
7. Medina RJ, O'Neill CL, Sweeney M, Guduric-Fuchs J, Gardiner TA, Simpson DA, Stitt AW.
Molecular analysis of endothelial progenitor cell (EPC) subtypes reveals two distinct cell populations with different identities. BMC Med Genomics. 2010 May 13;3:18.
8. Coffelt SB, Lewis CE, Naldini L, Brown JM, Ferrara N, De Palma M. Elusive identities and overlapping phenotypes of proangiogenic myeloid cells in tumors. Am J Pathol. 2010 Apr;176(4):1564-76.

Vereiste voorkennis
Solid knowledge on basic immunology is compulsory before the start of the course.

Aanbevolen voorkennis
A bachelor’s course immunology is recommended.

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

Overige informatie
Study groups and active participation are compulsory. A substitution assignment is required when one or more workshops have not been

attended, or when participation is judged as unsatisfactory.
A bachelor’s course immunology is recommended.

Lecturer(s):
prof. dr. R.E. Mebius, prof. dr. M. van Egmond, prof. dr. H.E. de Vries, prof. dr. Y. van Kooyk, dr. ing. S.J. van Vliet, dr. T. van der Pouw Kraan, dr. R. Reijmers

Biobusiness Course

Vakcode	M_OBIOBUS10 (311180)
Periode	Periode 3+4
Credits	3.0
Voertaal	Engels
Faculteit	VUmc
Coördinator	prof. dr. A.W. Griffioen
Examinator	prof. dr. A.W. Griffioen
Lesmethode(n)	Hoorcollege, Werkgroep
Niveau	500

Doel vak
Whether scientific discoveries get translated into novel therapeutics or diagnostics, is dependent on many issues. These include such down-to-earth factors as whether a drug can indeed be manufactured at large scale, and careful indication selection and clinical study planning. The goal of the course is to provide insight in the factors that dictate success in present-day development of therapeutics and diagnostics.

Questions that will be addressed are:
- What are the many factors involved in getting from a laboratory discovery to a novel approved medicine, from clinical and regulatory to economic issues;
- How does the pharma and biotech industry access innovation through strategic partnerships with universities and small companies;
- How do entrepreneurial universities contribute to innovation, and turn science into novel medicines and diagnostics?

After the course the students will have thorough knowledge and in-depth insight in:
- The scientific, clinical, regulatory and economic issues involved in present-day drug development;
- Which party plays which role at all stages from research to development to commercialisation;
- The keys to success in translating innovative technologies and therapeutic principles to new drugs and diagnostics.

Inhoud vak
The subjects of the course will include the following:
• General aspects of how several miracle drugs have been developed (Gleevec,Herceptin, Rituxan, Avastin, anti-TNF), form early laboratory research stage to development and clinical proof-of-principle, and the economic and regulatory issues involved;
• General aspects of how certain novel diagnostic tools for staging cancers and for determining drug sensitivity have been developed (for

instance for breast cancer, the mamma chip developed by Agendia);
• Impact of careful indication selection and clinical study planning in drug development;
• Regulatory issues regarding drug development, including impact of the European Clinical Trial Directive for Advanced medicinal Therapy Products;
• Examples of a number of VUmc spin-off companies and their activities in drug development and diagnostics;
• Legal and patent issues in technology transfer and partnerships between universities and pharma, biotech and devices companies.

Onderwijsvorm
There will be 24 contact hours in the form of lectures by the course coordinator and a number of invited lecturers. These will include external experts on molecular diagnostics and regulatory affairs, VUmc colleagues with presentation on their own spin-off companies, and TTO colleagues on legal and patent issues. In addition, the course consists of independent learning on the basis of exploring literature and business reports on selected topics, with the intent of preparing a final presentation and report at the end of the course by small groups.

Toetsvorm
The course will be concluded by group presentations on studies of scientific literature and business reports on development of certain drugs and diagnostics. These will be assigned by the course coordinator, and the literature and business studies will also be summarized in short written reports, to be delivered at the end of the course.

Literatuur
There is no mandatory literature for this course. The assignments involve reading of dedicated papers and viewing of web-based lectures.

Doelgroep
This course is optional for students of the Masters Oncology and Cardiovascular Research, who have completed at least three out of the four compulsory courses of their programme. If enough places are available, students from other MSc in Life Sciences may apply.

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

Overige informatie
If you have any questions or need extra information, please contact Maartje Klaassen (maartje.klaassen@vumc.nl).

Biostatistics

Vakcode	M_FBIOSTA16 ()
Periode	Periode 3
Credits	3.0
Voertaal	Engels
Faculteit	VUmc

Coördinator	dr. B.I. Witte
Examinator	dr. B.I. Witte
Lesmethode(n)	Hoorcollege, Practicum
Niveau	500

Doel vak
The aim of the course is to introduce several standard statistical methods and the use of the statistical software SPSS to the students.

Inhoud vak
This course focuses on the practical application and interpretation of statistical analyses. A lot of attention is given to regression analysis in case of continuous, binary or survival outcome variables. But also the t-test, the chi-square test and analysis of variance are discussed.
• analysis of continuous outcome variables: t-test, ANOVA and linear regression analysis;
• analysis of binary outcome variables: chi-square test and logistic regression;
• multiple regression analysis: association and prediction models;
• repeated measures analysis: repeated measures ANOVA, linear mixed models.

Literatuur
Lecture notes (i.e. PowerPoint sheets) are provided on blackboard.
Adviced (not compulsory!) books:
BR Kirkwood & JAC Sterne (2003). Essential Medical Statistics - 2nd edition. Blackwell Science Ltd, Oxford. [Statistical methodology]
SB Gerber & K Voelkl Finn (2005). Using SPSS for Windows – data analysis and graphics. Springer, New York. [SPSS; Electronic access at university via http://link.springer.com/book/10.1007/0-387-27604-1/page/1]

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

Cardiac disease

Vakcode	M_CCDMDT16 ()
Periode	Periode 1
Credits	6.0
Voertaal	Engels
Faculteit	VUmc
Coördinator	dr. W.S. Simonides
Examinator	dr. W.S. Simonides
Lesmethode(n)	Hoorcollege, Werkgroep
Niveau	400

Doel vak
To obtain a thorough understanding of the mechanisms underlying cardiac disease and current diagnostic and therapeutic modalities.
To get familiar with state-of-the-art knowledge and scientific frontiers

in the field of cardiac disease.

Inhoud vak
This course focuses on cardiac disease, with specific emphasis on heart failure, cardiac arrhythmias, pulmonary hypertension and right ventricular failure and myocardial infarction.
Clinicians and experimental researchers active in the area of scientific research for cardiac disease provide the lectures. Students are required to read scientific articles and to participate in scientific discussions.

Onderwijsvorm
Lectures, demonstrations and study groups

Toetsvorm
Written exam (knowledge test) and assignments

Literatuur
Scientific articles related to the specific lectures. More information about these scientific articles can be found on Blackboard.

Vereiste voorkennis
Bachelor in life sciences, biomedical sciences, (technical) medicine, movement sciences.

Aanbevolen voorkennis
Cardiovascular Physiology Concepts
Second edition
R.E. Klabunde

Doelgroep
Students following the Cardiovascular Research master program.

Uitleg in Blackboard
Course information, course reading, course announcements

Intekenprocedure
In order to take the exam of this course you should register at least 2 weeks in advance through the VUnet student portal. All rules and regulations concerning exams and retake of courses are described in the Academic and Examination Regulations (OER).

Overige informatie
This is an advanced course and basic knowledge of cardiac structure and function is required to complete the course successfully.

Examinator: Dr. W.S. Simonides
Vakcoordinator: Prof.dr. C. Boer

Containment Strategies of Infectious Diseases in Global Context

Vakcode	AM_470127 ()
Periode	Periode 1
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen

Coördinator	dr. D.R. Essink
Examinator	dr. D.R. Essink
Docent(en)	dr. D.R. Essink, prof. dr. P.R. Klatser, prof. dr. J.F. van den Bosch
Lesmethode(n)	Hoorcollege, Werkgroep
Niveau	500

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

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

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

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

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

Slide sets of lectures as made available on BlackBoard

Lecturers may make further readings available on BlackBoard.

Vereiste voorkennis
Basic knowledge about the pathogenesis of infectious diseases, microbiology and immunology

Aanbevolen voorkennis
Minor course AB_1046 "Infectious Diseases and Vaccine Development"

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

Intekenprocedure
Enrollment through BlackBoard.

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

Guest lecturers:
Dr. Jim van Steenbergen (RIVM/LUMC)
Dr. Helma Ruijs (RIVM)
Dr Frank Cobelens (KNCV)
Dr. Constance Schultsz (AIGHD/AMC)
Prof. dr. Maarten Postma (RUG)
Dr. Kitty Maassen (RIVM)
Dr. Koert Ritmeijer (MSF)
Prof. dr. Robert Sauerwein (UMC Nijmegen)
Prof. dr. Cees Hamelink (VU)
Prof. dr. Guus Rimmelzwaan (EMC Rotterdam)
Dr. Hans Zaaijer (Sanguin)
Prof. dr. Christina Vandenbroucke (VUMC)Minor course AB_1046 "Infectious Diseases and Vaccine Development"

Developmental Biology

Vakcode	AM_470613 ()
Periode	Periode 2
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	prof. dr. R.E. Koes

Examinator	prof. dr. R.E. Koes
Docent(en)	dr. R.F.G. Toonen, prof. dr. R.E. Koes
Lesmethode(n)	Hoorcollege, Werkcollege, Werkgroep, Deeltoets extra zaalcapaciteit
Niveau	500

Doel vak
The development of a single cell, the fertilized egg cell, into a complex organism with all its tissue and organs in the right place is one of the most intriguing phenomena in biology. Whereas disciplines like molecular and cell biology aim to unravel the molecular mechanisms of a single cell, developmental biology aims to understand how such mechanisms make cells work together in a coherent way to form an entire organism. The overall aim of this course is to provide insight into these molecular mechanisms, such as the regulation of the expression of master genes and cell-to-cell signaling pathways underlying plant and animal development.

Final attainment levels:
- the student has a basic understanding of morphological events that take place during embryogenesis in animals
- the student can describe and distinguish key-concepts in development, such as (i) pattern formation (ii) determination of cell fate, (ii) differentiation and link that to general phenomena known in molecular biology, such as gene regulation, epigenetic phenomena, cell-signalling etc.
- The student can describe the (dis)similarities in the development of animals as different as fruitflies and vertebrates, in terms of morphological events and underlying molecular mechanisms.
- The student can explain the paradox that development of organisms with very different morphologies is governed by deeply conserved genes, and understands the molecular evidence for the current ideas.
- The student acquires experience in the critical analysis and discussion of experimental data as presented in research papers and the presentation of such data for a large(r) audience.

Inhoud vak
The first two weeks will be shared with the MSc course Developmental Neurobiology of the Vertebrate Brain. The first week consists of lectures on general developmental biology. For the second week one of two
paths can be chosen: (1) Development of the brain or (2) Plant development. The first part of the course finishes with a written "mid term exam"
In the third and the fourth week the focus shift to specific "hot topics" and research. Three or four masterclasses will be given by invited speakers/researchers that will give an overview of their own research field and discuss their (recent) experimental results. Furthermore, students (couples) will choose 2-3 recent research papers on a hot topic of their interest that they will study in depth to prepare for a small masterclass at the end of week 4 in which they outline the current status of the chosen subject, and present (and critically evaluate) the latest experimental data. Students can freely choose papers on plant or animal development. This ensures that everyone can follow his/her own preference for animal or plant biology and that, in the end, everyone gets a broad view on what is is currently going on in (plant or animal) developmental biology.

Specific issues that we will address in the first two weeks are:
- General key-concepts in development, such as pattern formation, segmentation, determination of cell fate, with emphasis on the experimental evidence on which our current knowledge is based
- Research strategies that are widely used in developmental biology.
- Molecular mechanisms that govern the development of embryos in insects (Drosophila) and vertebrates
- Elementary aspects of stem cell biology and "reprogramming" of differentiated cells into stems cells
- Evolutionary aspects: how can it be that deeply conserved genes govern the development of organisms with entirely different bodyplans, like fruitflies and vertebrates, or weed plants and trees.
- Late events in embryogenesis, the formation of organs (organogenesis). This will be entirely focused on development of the brain (for students taking the path Brain development)
- Early (embryogenesis) and late events (development of flowers and leaves) in the development of plants. What are similarities and differences with the development of animals?

In the last two weeks we will focus in depth on research concerning particular "topics that are currently "hot" in developmental biology. Subjects that will be covered by invited speakers are:
- Development and functioning of stem cells and stem cell niches in the intestine.
- Role of Hox genes in the segmentation and later development of vertebrates
- Molecular mechanisms that govern pattern formation in plants
Subjects that wiil be covered in the masterclasses given by student depends on the choices that are made during the course and are, therefore, not entirely predictable beforehand. Some of the subjects that will almost certainly be covered are:
- Reprogramming of differentiated cells into stems cells and dangers/possibilities for use of such cells in therapy
- Intercellular movement of proteins like transcription factors, which were hitherto always believed to act only in the cells where they are synthesized

Onderwijsvorm
Lectures and masterclasses (~ 58 hrs).
Self study (~ 55 hrs)

Toetsvorm
Written exam (50%)
Oral presentations and (written) abstract (40%)
Active participation to discussions during masterclasses (10%)

Literatuur
There is no specific handbook. You might find it useful to consult, on occasion, a handbook (any) to refresh your memory on some basic cellular processes, like gene regulation, signaling and so on, if that is necessary.
Handouts, incl. PowerPoint files of lectures, pdf files of relevant review and research papers will be provided via the Blackboard site.

Vereiste voorkennis
Basic knowledge (level 1/2) of molecular biology in particular mechanisms underlying regulation of gene expression, cell-signalling.

General affection for molecular biology is recommended

Doelgroep
Master students: Biomolecular Sciences, Biology, Biomedical Sciences

Diabetes and vascular disease

Vakcode	M_CDVDMDT16 ()
Periode	Periode 2
Credits	6.0
Voertaal	Engels
Faculteit	VUmc
Coördinator	dr. W.S. Simonides
Examinator	dr. W.S. Simonides
Lesmethode(n)	Hoorcollege, Werkgroep
Niveau	400

Doel vak
To obtain a thorough understanding of the mechanisms underlying the development of diabetes and vascular disease and current diagnostic and therapeutic modalities.
To get familiar with state-of-the-art knowledge and scientific frontiers in the field of cardiac disease.

Inhoud vak
This course focuses on cardiac disease, with specific emphasis on renal disease and dialysis, obesity and diabetes, and vascular thrombosis and inflammation.
Clinicians and experimental researchers active in the area of scientific research for vascular disease provide the lectures. Students are required to read scientific articles and to participate in scientific discussions.

Onderwijsvorm
Lectures, demonstrations and study groups

Toetsvorm
Written exam (knowledge test) and assignments

Literatuur
Scientific articles related to the specific lectures. More information about these scientific articles can be found on Blackboard.

Vereiste voorkennis
Bachelor in life sciences, biomedical sciences, (technical) medicine, movement sciences.

Aanbevolen voorkennis
Cardiovascular Physiology Concepts
Second edition
R.E. Klabunde

Doelgroep
Students following the Cardiovascular Research master program.

Uitleg in Blackboard
Course information, course reading, course announcements.

Intekenprocedure
In order to take the exam of this course you should register at least 2 weeks in advance through the VUnet student portal. All rules and regulations concerning exams and retake of courses are described in the Academic and Examination Regulations (OER).

Overige informatie
This is an advanced course and basic knowledge of cardiac structure and function is required to complete the course successfully.

Examinator: Dr. W.S. Simonides
Vakcoordinator: Prof.dr. C. Boer

Ethics in Life Sciences

Vakcode	AM_470707 ()
Periode	Periode 3
Credits	3.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	prof. dr. J.T. de Cock Buning
Examinator	prof. dr. J.T. de Cock Buning
Docent(en)	prof. dr. J.T. de Cock Buning, dr. J.F.H. Kupper, P. Klaassen MA
Lesmethode(n)	Hoorcollege, Werkgroep
Niveau	400

Doel vak
To provide a toolbox of ethical instruments to analyze properly moral problems related (to one's own) research in the life sciences and beyond
• To acquire conceptual knowledge of the central concepts in applied philosophy and professional ethics
• To be able to execute an ethical reflection on issues related to one owns life science
specialization and to open it for an impartial and constructive discussion
• To conduct, as a team based project, a moral dialogue
• To acquire the necessary skills to handle ethical issues in an accountable manner, as a professional academic beyond one's own inclinations and prejudgments
. To show a respectful and accountable attitude in dealing with group dynamics during the work groups and project.

Inhoud vak
Researchers in life sciences generate the knowledge that builds the future of our society. Therefore, professional academics should be accountable for their decisions, experimental designs and presentation of results. In this short course, the principles of justification will be illustrated with cases of technology ethics and medical ethics. The way an ethical review committee on animal research works, is simulated by a role play exercise on an actual research protocol. Finally, as a

group training project, an ethical dialogue is prepared and executed in confrontation with another team.

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

Toetsvorm
• Degree of intellectual participation in the workgroups (10%)
• exam (50%)
• written and verbal execution of the ethical dialogue (40%)
All three elements have to be passed

Literatuur
Available on Blackboard

Vereiste voorkennis
Bsc Biology, Biomedical Sciences, Psychology with profile Biological Psychology or Neuropsychology

Doelgroep
Compulsory course in all FALW Master programmes, except Health Sciences and Neuro Sciences

Overige informatie
Lectures in English, Most of the work groups are in Dutch. Non Dutch speaking students will be placed in English work groups. All presentations and plenary discussions in English.
In order to maximize the experience of differences in values and preferences, and to increase meaningful ethical inquiry we will place you randomly in the workgroups. Placement will be communicated after the introduction lecture.

From advanced imaging to stemcells

Vakcode	M_CFAISC16 ()
Periode	Periode 2
Credits	6.0
Voertaal	Engels
Faculteit	VUmc
Coördinator	dr. W.S. Simonides
Examinator	dr. W.S. Simonides
Lesmethode(n)	Hoorcollege, Werkgroep
Niveau	400

Doel vak
To obtain a thorough understanding of state-of-the-art imaging techniques in the experimental and clinical setting that can be used for scientific research and novel diagnostic and therapeutic modalities in patients with cardiovascular disease.
To get familiar with the role of personalized medicine in the treatment of cardiovascular diseases.

Inhoud vak
This course focuses on state-of-the-art imaging techniques that are used during experimental and clinical scientific research, including super-resolution microscopy, PET-CT and optical imaging of the microvasculature.
The treatment of cardiovascular disease will increasingly rely on personalized medicine and patient-centered care. The student will get familiar with developments like genotyping, systems biology and remote monitoring.

Onderwijsvorm
Lectures, demonstrations and study groups

Toetsvorm
Written exam (knowledge test) and assignments

Literatuur
Scientific articles related to the specific lectures. More information about these scientific articles can be found on Blackboard.

Vereiste voorkennis
Bachelor in life sciences, biomedical sciences, (technical) medicine, movement sciences.

Aanbevolen voorkennis
Cardiovascular Physiology Concepts
Second edition
R.E. Klabunde

Doelgroep
Students following the Cardiovascular Research master program.

Uitleg in Blackboard
Course information, course reading, course announcements

Intekenprocedure
In order to take the exam of this course you should register at least 2 weeks in advance through the VUnet student portal. All rules and regulations concerning exams and retake of courses are described in the Academic and Examination Regulations (OER).

Overige informatie
This is an advanced course and basic knowledge of cardiac structure and function is required to complete the course successfully.

Examinator: Dr. W.S. Simonides
Vakcoordinator: Prof.dr. C. Boer

Genomes and Gene Expression

Vakcode	AM_470614 ()
Periode	Periode 1
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. J.M. Kooter
Examinator	dr. J.M. Kooter
Docent(en)	dr. J.M. Kooter
Lesmethode(n)	Hoorcollege, Werkgroep, Deeltoets extra zaalcapaciteit
Niveau	400

Doel vak
Course objectives:
The student should be able, at the molecular level, to
- describe the composition of eukaryotic and prokaryotic genomes and identify and indicate the function of the different sequences
- explain and dissect the process of transcription initiation, - elongation and - termination, and how these processes are regulated, mainly in eukaryotes
- describe in detail the structure and composition of chromatin, the post-translational modifications of histone proteins, the enzymatic machinery involved and their control
- distinguish between general and the various types of specific transcription factors, and explain their collaboration to induce or repress gene expression
- describe the various forms of DNA modification, their biochemistry, and impact on genome maintenance and gene expression in various somatic tissues
- describe the epigenetic reprogramming during mammalian embryonic development, parental imprinting, and differentiation
- explain how non-protein encoding RNAs can affect gene expression
- explain the various types of RNA processing and post-transcriptional regulation of gene expressing and design experiments to study these processes
- apply currently-used experimental approaches and techniques to perform gene specific and genome-wide expression studies

Inhoud vak
To achieve the course objectives, the following topics will be discussed:
• Genome structure, Transcriptional regulation and Epigenetic mechanisms:
• Genome organization: coding versus non-coding sequences
• Composition and biochemistry of basic transcription machinery
• General and specific transcriptional regulators and their regulation
• Transcription initiation, elongation and termination
• Identification and function of regulatory sequences: promoters, enhancers, suppressors, boundaries
• Epigenetics: Chromatin structure and histone modifications: writers-readers-erasers
• Epigenetics: DNA modifications (e.g. methylation) and their biochemical properties
• Epigenetic reprogramming during mammalian development
• Monoallelic gene expression and its importance for embryonic development and other biological processes

• 3D Nuclear structure and long range DNA interactions
• Transcriptional regulation and chromatin changes in stem cells, during differentiation, and development
• Cellular memory: establishing and maintenance of differentiation status
• Regulatory networks: the various ways by which regulators themselves are regulated
• Short and long non-coding RNAs and the mechanism by which they affect gene expression
• Experimental approaches and Techniques to study gene expression, differentiation and homeostasis

Post-transcriptional regulation
• integration of transcriptional and post-transcriptional control
• RNA processing, including alternative splicing, and its regulation
• Nucleo-cytoplasmic RNA transport
• RNA stability and degradation pathways
• RNA interference (siRNAs)
• Translation regulation and RNA degradation by micro(mi)RNAs
• RNA-editing and its biological importance
• Experimental approaches and Techniques to study post-transcriptional regulation of gene expression

Onderwijsvorm
- Lectures and interactive meetings, including lectures by guest speakers who are working in a
particular field of research that is discussed in the course (ca 45 hr).
- Weblectures by experts (ca 5 hr)
- Self study (ca 100 hr)

Toetsvorm
There are 2 sub-exams:
- First exam is half way the course and consists of Multiple Choice question and accounts for 40% of the final mark
- Second exam is at the end of the course and consists of open questions and accounts for 60% of the final mark. For the second exam, knowledge of the first part is needed. Resit of a sub-exam is not allowed.

Literatuur
• Book: 'Gene Control' 2nd edition, by David Latchman, Garland Science
• Research and Review articles on specific topics, illustrating the latest developments in the field (from Blackboard site)
• PPT - lecture notes

Vereiste voorkennis
Basic concepts in Molecular Biology, Genetics, and Biochemistry

Doelgroep
Master students: Biomolecular Sciences, Biology, Biomedical Sciences, Pharmaceutical Sciences, Oncology, and Medical Natural Sciences.

Intekenprocedure
Enrollment through studentportal: Vunet.vu.nl

Overige informatie
Compulsory portal course for MSc students Biomolecular Sciences, all differentiations.

Heart and circulation:basic principles

Vakcode	M_CHCBP16 ()
Periode	Periode 1
Credits	6.0
Voertaal	Engels
Faculteit	VUmc
Coördinator	dr. W.S. Simonides
Examinator	dr. W.S. Simonides
Lesmethode(n)	Hoorcollege, Werkgroep
Niveau	400

Doel vak
To obtain a thorough understanding of the function of heart and circulation, including integrative physiological concepts. cardiovascular function and the role of the underlying molecular components and mechanisms in the development of cardiovascular pathology.

Inhoud vak
This course focuses on the fundamental aspects of normal cardiac and vascular function. The physiology of the heart and the circulation in health and disease will be addressed, with emphasis on the molecular mechanisms involved. Moreover, integrative physiology concepts focusing on oxygen transport and coagulation will be discussed. Students are required to read scientific articles and to participate in scientific discussions.

Onderwijsvorm
Lectures, demonstrations and study groups

Toetsvorm
Written exam (knowledge test) and assignments

Literatuur
Scientific articles related to the specific lectures. More information about these scientific articles can be found on Blackboard.

Vereiste voorkennis
Bachelor in life sciences, biomedical sciences, (technical) medicine, movement sciences.

Aanbevolen voorkennis
Cardiovascular Physiology Concepts
Second edition
R.E. Klabunde

Doelgroep
Students following the Cardiovascular Research master program.

Uitleg in Blackboard
Course information, course reading, course announcements

Intekenprocedure
In order to take the exam of this course you should register at least 2 weeks in advance through the VUnet student portal. All rules and regulations concerning exams and retake of courses are described in the Academic and Examination Regulations (OER).

Overige informatie
This is an advanced course and basic knowledge of cardiac structure and function is required to complete the course successfully.

Examinator: Dr. W.S. Simonides
Vakcoordinator: Prof.dr. C. Boer

Life Cell Imaging

Vakcode	M_CLIFECE09 (3120008)
Periode	Periode 3+4+5
Credits	3.0
Voertaal	Engels
Faculteit	VUmc
Coördinator	dr. R.J.P. Musters
Examinator	dr. R.J.P. Musters
Lesmethode(n)	Hoorcollege, Werkgroep
Niveau	500

Inhoud vak
Advances in light microscopy, digital image processing, and the development of a variety of powerful fluorescent probes present expanding opportunities for investigating the cardiovascular system. This laboratory and lecture course will provide participants with the theoretical and practical knowledge to utilize novel cell imaging technologies. Students will learn the principles of light microscopy and flow cytometry as well as use of different types of electronic cameras, laser-scanning systems, functional fluophores, delivery techniques, and digital image- processing software.

Literatuur
Syllabus including relevant articles.

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

Overige informatie
Contact: r.musters@vumc.nl

Literature Study

Vakcode	M_CLITSTU16 ()
Periode	Ac. Jaar (september)
Credits	9.0
Voertaal	Engels
Faculteit	VUmc
Coördinator	dr. D.W.D. Kuster
Examinator	dr. D.W.D. Kuster

Niveau	500

Major Internship

Vakcode	M_CMAJORI16 ()
Periode	Ac. Jaar (september)
Credits	36.0
Voertaal	Engels
Faculteit	VUmc
Coördinator	dr. D.W.D. Kuster
Examinator	dr. D.W.D. Kuster
Niveau	500

Minor Internship

Vakcode	M_CMINORI16 ()
Periode	Ac. Jaar (september)
Credits	30.0
Voertaal	Engels
Faculteit	VUmc
Coördinator	dr. D.W.D. Kuster
Examinator	dr. D.W.D. Kuster
Niveau	400

Proteomics in Biomedical Research

Vakcode	M_CPROTBI09 (3120006)
Periode	Ac. Jaar (september), Periode 3+4+5
Credits	3.0
Voertaal	Engels
Faculteit	VUmc
Coördinator	dr. C.R. Jimenez
Examinator	dr. C.R. Jimenez
Lesmethode(n)	Hoorcollege, Werkgroep
Niveau	500

Doel vak
Function and structure of cells depend on the composition of proteins. During pathological conditions, the expression of proteins is altered leading to impaired function/structure of cells. Apart from changes in expression level, post-translational protein changes occur as a result of altered signaling pathways. The large-scale analysis of proteins and their quantitative changes in health and disease, a research field called proteomics, may provide candidate biomarkers and targets for therapeutic interventions.

This proteomics course consists of one week of theory (lectures and

literature study) and one week of practice in the lab. Together this will provide a solid basis for the understanding of what proteomics is about, how its central technique, mass spectrometry, can be used for global protein identification and quantification, and what biomedical/clinical questions can be answered using an appropriate experimental design. In the second week, students will get hands-on experience with a real proteomics experiment and the generated data will be used to illustrate what bioinformatics analyses can be done to enable biological insight of large scale data.

Inhoud vak
Protein identification by tandem mass spectrometry and database searching;
Gel electrophoresis and mass spectroscopy techniques to quantify isoform expression and the nature and extent of post translational modifications;
Data mining: placing large scale protein expression data in a biological context (network analysis).

Literatuur
Syllabus including relevant articles

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

Overige informatie
Minimum number of participants: 5, maximum: 12
For optimal participation, basic knowledge of molecular and cellular biology is needed.

Contact:
Prof. dr. Connie R. Jimenez
Head OncoProteomics Laboratory
Department of Medical Oncology, VUmc Cancer Center Amsterdam
e-mail: c.jimenez@vumc.nl
Website: www.oncoproteomics.nl

Radiation Protection Course, Level 5B

Vakcode	M_CRADPRO09 (311164)
Periode	Ac. Jaar (september)
Credits	3.0
Voertaal	Engels
Faculteit	VUmc
Coördinator	G.W.M. Visser BSc
Lesmethode(n)	Hoorcollege, Werkgroep
Niveau	500

Doel vak
Aim of the course "Working with Radioactivity" is preparing researchers, assistants and students for safely working with radioactive substances

and/or apparatus emitting ionising radiation.

Onderwijsvorm
The course encloses one week, divided in theory (40%) and practical work (60%). For both parts there will be a guide book in Dutch or English available. The experiments will lead to a practical work report to be used as the guidance for future radiological activities. Participants shall receive a certificate as proof of their participation in the course, if they are judged to work safely with radioactivity. The with this certificate related allowance to work with radioactivity is limited to the laboratories of VU University/VUmc.

Toetsvorm
Written exam, twice a year. Only students who pass the exam and thus obtain the governmental diploma "Stralingshygiëne, deskundigheidsniveau 5B" get 3 ECTS. The diploma gives allowance to work with radioactivity in the Netherlands, and most often even in Europe and America.

Overige informatie
For each course the maximal number of participants is 12. The course will be given in week 37 (September 11 – September 15) and in week 46 (November 13 – November 17) of 2017.

Contact:
A.Y. Rijnders, BSc
Administrator course Werken met Radioactiviteit / Radiation Protection – niveau 5B
Radiologie & Nucleaire Geneeskunde
email: ay.rijnders@vumc.nl

G.W.M. Visser, BSc
Coordinator course Werken met Radioactiviteit / Radiation Protection – niveau 5B
email: gwm.visser@vumc.nl

Website: http://www.rnc.vu.nl
N.B. International students who want to participate in the course are requested to contact the coordinator of the course before application.

Writing Scientific English

Vakcode	M_FWSE09 (3120015)
Periode	Periode 3
Credits	3.0
Voertaal	Engels
Faculteit	VUmc
Coördinator	drs. J.K.A. Meijer
Examinator	drs. J.K.A. Meijer
Lesmethode(n)	Werkcollege
Niveau	500

Doel vak
The aim of this course is to provide Master's students with the essential linguistic know-how for composing a successful research proposal in English that is well organized, idiomatically and

stylistically appropriate and grammatically correct.
At the end of the course students
- know how to structure a research proposal;
- know what the information elements are in parts of their research proposal;
- know how to produce clear and well-structured texts on complex subjects;
- know how to write well-structured and coherent paragraphs;
- know how to construct effective sentences;
- know what collocations are and how to use them appropriately;
- know how to adopt the right style (formal style, cohesive style, conciseness, hedging)
- know how to avoid the pitfalls of English grammar;
- know how to use punctuation marks correctly;
- know how to cite sources effectively;
- know what their own strengths and weaknesses are in writing;
- know how to give effective peer feedback.

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

Topics addressed during the course include the following:
- What makes a good proposal?
o 5 crucial questions you must always answer
- Considering you readers: who are they? What do they expect? How do they read your text? How does that affect your writing?
o The importance of considering reading strategies
- What is the basic structure of a research proposal and what are they key elements of each section?
- How do you "sell" your project / research? Why language matters!
Strategies for writing successful research proposals: using the English language effectively and enhancing readability
o Keeping it brief: don’t waste words
o Writing well-structured and coherent paragraphs
o Writing effective sentences (sophisticated word order, information distribution)
o Using modality and boosters to your advantage
o Using appropriate and effective vocabulary
o Arguing convincingly
o Using active constructions (but also using the passive effectively)
- Understanding grammar (tenses, basic word order, agreement, prepositions, etc.)
- Understanding punctuation
- Referring to sources: summarising, paraphrasing, quoting (how and when?)
- Avoiding plagiarism

Onderwijsvorm
Research proposal writing in English is an four-week course that consists of 4 contact hours a week. Students are required to spend at

least 6 to 8 hours of homework per week. They will work through a phased series of exercises that conclude with the requirement to write several text parts (e.g. Introduction/Background, Relevance section, Summary). Feedback on the writing assignments is given by the course teacher and by peers.

Toetsvorm
Students will receive 3 course credits when they meet the following requirements:
- Students hand in three writing assignments (e.g. Introduction, Relevance section, Summary) and get a pass mark for all writing assignments;
- Students provide elaborate peer feedback;
- Students attend at least 7 out of 8 sessions (or, in case of 6 sessions, they attend at least 5);
- Students are well prepared for each session (i.e. do all homework assignments);
- Students actively participate in class;
- Students do not plagiarise or self-plagiarise.

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

Doelgroep
This course is only open to students of the two-year Master's programme Oncology. These students are only eligible to the course if they have already conducted scientific research (e.g. for their Bachelor’s thesis) or if they will be working on a research project when taking Scientific Writing in English.

Intekenprocedure

All students of the Master's Programme in Oncology have to attend the compulsory Courses of the programme.

For all you courses you must register through VUnet.vu.nl This way, you find out immediately if a place is available. All activities for which you are registered will be displayed in your personal timetable, which also includes any timetable changes. If you have not registered for a course then you will not be admitted to that course, you will not be assigned to a group, you will not be able to use Blackboard, you will have no timetable, your grades will not be recorded, etc. In short, you will not be able to take part.

From the moment that you are conditionally registered for a programme, you can sign up for specific courses via VUnet.vu.nl

This course is only meant for Master Oncology students.

Overige informatie
- To do well, students are expected to attend all lessons. Group schedules are to be found on Blackboard.
- A VUnet registration for this course automatically gives access to the corresponding Blackboard site. Group registration only takes place via Blackboard (general groups: registration by students following FALW programmes containing this course, groups assigned to specific studies: registration through programme and course coordinator).

- Make sure Scientific Writing in English does not overlap with another course.
- If you have registered for a group in Blackboard, you are expected to attend all sessions (eight). If you decide to withdraw from the course, do so in time, both on Blackboard and in VUnet. This all will avoid a 'fail' on your grade list for not taking part in this course and allows other students to fill in a possible very wanted group spot.
- For specific Blackboard matters concerning this course, please contact by sending email to masteroncology@vumc.nl