Cardiovascular Research

VU University Amsterdam - VUmc - M Cardiovascular Research - 2015-2016

This study guide contains information on the Cardiovascular Research Master Programme organised by the VUmc School of Medical Sciences for the academic year 2015-2016. All information about the aim of the programme, the structure of the course components, admission, planning, student facilities etc. are available on the faculty website VUmc School of Medical Sciences.

Aim of the study programme
Every day, more than 100 people die of cardiovascular diseases in the Netherlands. To reduce this number of casualties, more scientific research focusing on the pathophysiology and treatment of cardiovascular disease is needed. The Cardiovascular Research Master 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. Duration of the programme is two years (120 European Credits (EC). The master programme is composed of compulsory courses, optional courses, an academic course, a study of literature and two practical training periods (minor and major internships, 63 credits in total). Cardiovascular research is interdisciplinary by nature and flourishes by the collaboration between clinical researchers and basic scientists. This interdisciplinary approach is a key element of our programme.

VU medical center 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 Cardiovascular Research Master programme is provided by staff members of the Institute for Cardiovascular Research (http://www.vumc.nl/afdelingen/ICar-VU/).

Course information
The Cardiovascular Research Master programme consists of:

emptyempty**Year 1**

Course	**Credits**	**Period**
Pathophysiology of heart and circulation	6	September
Clinical aspects of heart and circulation	6	October
Vascular Function and metabolic disease	6	November
Remodelling of the circulatory system	6	December
Biostatistics:	3	January
Writing scientific English	3	January
Academic core	3	Academic year
Minor internship	30	February- June

Year 2

Course	**Credits**	**Period**
Optional courses	15	September
Literature study	9	October
Master's Thesis	36	February – June

General information about organisation, education, research and patient's care within VUmc can be found on the VUmc website: www.vumc.nl.
For more information please contact the coordinator Cardiovascular Research Master

Dr. Edwin Kanters
Telephone: 020-4445895
Email: cvrmaster@vumc.nl

Student Service Centre (SSC):
Students can turn to the Student Service Centre with general questions about the graduation, registration for courses and examinations, registration of grades and schedules.
School of Medical Sciences
1st floor (follow signs to corridor D)
Van der Boechorststraat 7 - 1081 BT Amsterdam
Email: studentenbalie@vumc.nl

Summary of requirements and guidelines for participation

Compulsory courses
All students of the Cardiovascular Research Master must attend the compulsory courses of the programme. If a particular course can have more participants, student of other Master's programmes can attend the course, providing that the meet the entry requirements of the programme.

Optional courses
Students have to have a consent from the examination board, if they want to attend an optional course. An approval can be asked via a digital approval: Approval of Optional Course, this form can be found on the faculty website VUmc School of Medical Sciences . Courses attended without the consent of the board of examiners will not be registered. For registration of optional courses students use the VUnet portal. If registration is not possible by using the VUnet portal, contact your master coordinator.

Internships and study of literature
The examination board has to give its approval for all internships and the literature study.
An approval can be asked via a digital approval: Approval of internships, this form can be found on the faculty website VUmc School of Medical Sciences Unapproved internships will not be registered by Student Service Centre.

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Master Cardiovascular Research - Optional Courses

The Cardiovascular Research Master has reserved 18 ECTS credit points for optional courses. The optional courses are listed underneath. These courses are approved by the examination board of the Cardiovascular Research Master and do not need individual student approvals. Additional optional courses will be announced on the blackboard site "Cardiovascular Research Master ". If a student wants to follow a course which is not indicated, an individual approval by the examination board is required. Some optional courses are organized together with or by other faculties, like FEW (Faculty of Exact Sciences and FALW)(Faculty of Earth and Life Sciences).

Courses:

Name	Period	Credits	Code
Academic teaching and presenting	Period 3+4	3.0	M_CACTP09
Advanced Cardiac Diagnostics	Period 3+4+5	3.0	M_CCARDIA09
Advanced Molecular Immunology and Cell Biology	Period 1	6.0	AM_470656
Containment Strategies of Infectious Diseases in Global Context	Period 1	6.0	AM_470127
Developmental Biology	Period 2	6.0	AM_470613
Ethics in Life Sciences	Period 3	3.0	AM_470707
Extension Practical Training	Ac. Year (September)	3.0	M_CEXTENS09
Genomes and Gene Expression	Period 1	6.0	AM_470614
Life Cell Imaging	Period 3+4+5	3.0	M_CLIFECE09
Proteomics in Biomedical Research	Period 3+4+5	3.0	M_CPROTBI09
Radiation Protection Course, Level 5B	Ac. Year (September)	3.0	M_CRADPRO09
Research Ethics	Period 3+4+5	3.0	M_FETHICA14

Master Cardiovascular Research - Compulsory Courses

All students of the Cardiovascular Research Master have to attend the compulsory Courses of the programme. If more study places are available, students of other Master's programmes can attend the course, providing that they meet the entry requirements.

Programme components:

- Academic Core Cardiovascular

Courses:

Name	Period	Credits	Code
Biostatistics	Period 3	3.0	M_CBIOSTA09
Clinical Aspects of Heart and Circulation	Period 1	6.0	M_CCLINBIO09
Pathophysiology of Heart and Circulation	Period 1	6.0	M_CPATHO09
Remodelling of the Circulatory System	Period 2	6.0	M_CREMODE09
Vascular Function and Metabolic Diseases	Period 2	6.0	M_CVASCFU09
Writing Scientific English	Semester 2	3.0	M_FWSE09

Academic Core Cardiovascular

Courses:

Name	Period	Credits	Code
Academic Core Cardiovascular 1st year	Ac. Year (September)	0.0	M_CACCOREA14
Academic Core Cardiovascular 2nd year	Ac. Year (September)	3.0	M_CACCOREB14

Master Cardiovascular Research - Practical Training

In total, a student has to spend 63 ECTS credit points for two internships: a minor (=>21 ECTS) and a major (=>36 ECTS). Both internships have to be performed at a research laboratory, acknowledged by the examination board of the Cardiovascular Research Master: One internship has to be performed at one of the departments/laboratories of the VU/VUmc and the other one preferentially "outside" the VU. It is not allowed to do both internships outside the VU/VUmc.
Thesis
The Master's thesis includes the results of the major internship, integrated with and from the perspective of the knowledge acquired in the cursory education. The Master's thesis will get an uniform cover provided and designed by the Master. The Master's thesis will be defended in public.

Courses:

Name	Period	Credits	Code
Major Internship	Ac. Year (September)	36.0	M_CMAJORI09
Major Internship 36	Semester 1, Semester 2	36.0	M_CMAJORI15
Minor Internship	Ac. Year (September)	21.0	M_CMINORI09
Minor Internship 30	Semester 2	30.0	M_CMINORI15

Master Cardiovascular Research - Study of Literature

The study of literature will be carried out under supervision, yet highly independent. It is also possible that the student proposes his or her own subject and presents an own question. The study may be focused on a scientific biomedical question, but a more applied or social question is also allowed.
The aim of the literature study is that the student will be able to select, evaluate and discuss critically relevant literature. Based on the study, the student has to explain clearly not only the state of the art, but also the limitations and problems. 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.

Courses:

Name	Period	Credits	Code
Study of Literature	Ac. Year (September)	9.0	M_CLITSTU09

Academic Core Cardiovascular 1st year

Course code	M_CACCOREA14 ()
Period	Ac. Year (September)
Credits	0.0
Language of tuition	English
Faculty	VUmc
Coordinator	dr. E. Kanters
Examinator	dr. E. Kanters
Teaching method(s)	Seminar
Level	400

Course objective
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.

Course content
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.

Form of tuition
Interactive lectures and assignments

Registration procedure
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.

Remarks
Contact: e.kanters@vumc.nl

Academic Core Cardiovascular 2nd year

Course code	M_CACCOREB14 ()
Period	Ac. Year (September)
Credits	3.0
Language of tuition	English
Faculty	VUmc
Coordinator	dr. E. Kanters
Examinator	dr. E. Kanters
Teaching method(s)	Seminar
Level	500

Academic teaching and presenting

Course code	M_CACTP09 ()
Period	Period 3+4
Credits	3.0
Language of tuition	English
Faculty	VUmc
Coordinator	dr. J.M.H. Swennen
Examinator	dr. J.M.H. Swennen
Teaching method(s)	Study Group, Lecture
Level	500

Course objective
This course is meant for students who prepare for a career in the academic world and becoming researcher (to start with a PhD student) and a lecturer, as teachers in Higher education are often called. During this course you learn how to present in an academic and attractive way, how to prepare lectures and interactive teaching and how to interact well with students and an academic audience.

Form of tuition

Introduction: Getting to know each other, Explanation of the course, ssignments and assessment, Introduction into teaching and learning in HE, Preparations of lectures, Feedback, Reflection , Interaction with groups, Introduction mini paper, Introduction good academic resentations, Plenary Presentations, Plenary lectures, Preparation of lecture about teaching and learning in HE, Preparing the mini paper.

Type of assessment

1. Lecture: A complete and well prepared lecture with attention for the group process and two appropriate student activities. (40%),The performance of the lecture (40%), The feedback of the group and the course lecturer on the performance and the reflection of the group members on the feedback (30%) Total for assessment 40
2. Presentation: (Presentation (50%) The feedback of the group and the course lecturer on the performance and the reflection of the group members on the feedback (50%). Total for assessment 40%
3. Mini paper and two reviews of a concept mini paper of a group member.
Total for assessment 20%

Course reading
The study material is given during the course and also involves of the active participation of the student . Here are some main books, a journal and a useful web site.

Ramsden, P. (2013). Learning to Teach in Higher Education: Taylor & Francis.
Svinicki, M. D., & McKeachie, W. J. (2011). Mckeachie's Teaching Tips: Strategies, Research, and Theory for College and University Teachers: Wadsworth, Cengage Learning.

Teaching in Higher Education is an international, peer-reviewed journal. The journal addresses the roles of teaching, learning and the curriculum in higher education in order to explore and clarify the intellectual challenges which they present. The journal is interdisciplinary and aims to open up discussion across subject areas by involving all those who share an enthusiasm for learning and teaching:
http://www.tandf.co.uk/journals/titles/13562517.asp

Higher education academy: http://www.heacademy.ac.uk/

Advanced Cardiac Diagnostics

Course code	M_CCARDIA09 (3120004)
Period	Period 3+4+5
Credits	3.0
Language of tuition	English
Faculty	VUmc
Coordinator	dr. O. Kamp
Examinator	dr. O. Kamp
Teaching method(s)	Lecture, Study Group
Level	500

Course objective
This course focuses on the physical background and clinical application of different cardiac imaging modalities.

Course content
- Lectures on the physical background of MRI, SPECT/CT, echo, PCI
- Visits to the abovementioned techniques in the clinic
- Literature study

Type of assessment
Written exam and literature study.

Course reading
Lectures/articles handed out during course.

Registration procedure
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.

Advanced Molecular Immunology and Cell Biology

Course code	AM_470656 ()
Period	Period 1
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	prof. dr. M. van Egmond
Examinator	prof. dr. M. van Egmond
Teaching staff	drs. K. Brouwer, prof. dr. R.E. Mebius, dr. T. van der Pouw Kraan, prof. dr. H.E. de Vries, prof. dr. M. van Egmond, dr. ing. S.J. van Vliet
Teaching method(s)	Lecture, Study Group
Level	500

Course objective
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.

Course content

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.

Form of tuition
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

Type of assessment
A written exam (T) at the end of week 4 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.

Course reading
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.

Entry requirements
Solid knowledge on basic immunology is compulsory before the start of the course.

Recommended background knowledge
A bachelor’s course immunology is recommended.

Target group
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.

Remarks
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.

Biostatistics

Course code	M_CBIOSTA09 (3120003)
Period	Period 3
Credits	3.0
Language of tuition	English
Faculty	VUmc
Coordinator	dr. B.I. Witte
Examinator	dr. B.I. Witte
Teaching method(s)	Lecture, Study Group
Level	500

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

Course content
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.

Form of tuition
The course consists of six lectures, six exercise classes and self-study. In the exercise classes students will actively apply the discussed statistical methods to several datasets using the statistical software SPSS. Final examination will take place at the end of the 4th week via a written (open book) exam (50%) and an SPSS assignment (50%).

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

Registration procedure

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.

Clinical Aspects of Heart and Circulation

Course code	M_CCLINBIO09 (3120000)
Period	Period 1
Credits	6.0
Language of tuition	English
Faculty	VUmc
Coordinator	dr. L.J.M. Juffermans
Examinator	dr. L.J.M. Juffermans
Teaching method(s)	Lecture, Study Group
Level	400

Course objective
This course focuses on the basic principles and clinical aspects of normal cardiac function and dysfunction.

Course content
The following topics will be addressed:
Coronary artery disease,
Cardiomyopathies,
Heart failure,
Inflammation of the heart: myocarditis,
Arrhythmias.

Form of tuition
Lectures, working groups, assignments

Type of assessment
Written exam and assignments

Course reading
Book: Cardiology, Crawford-Di Marco-Paulus 3rd Ed (recommended).

Registration procedure
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.

Containment Strategies of Infectious Diseases in Global Context

Course code	AM_470127 ()
Period	Period 1
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen

Coordinator	prof. dr. J.F. van den Bosch
Examinator	dr. D.R. Essink
Teaching staff	dr. D.R. Essink, prof. dr. P.R. Klatser, prof. dr. J.F. van den Bosch
Teaching method(s)	Lecture, Study Group
Level	500

Course objective
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.

Course content
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.

Form of tuition
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.

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

Course reading
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.

Entry requirements
Basic knowledge about the pathogenesis of infectious diseases, microbiology and immunology

Recommended background knowledge
Minor course AB_1046 "Infectious Diseases and Vaccine Development"

Target group
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

Registration procedure
Enrollment through BlackBoard.

Remarks
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)

Developmental Biology

Course code	AM_470613 ()
Period	Period 2
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Examinator	prof. dr. R.E. Koes
Teaching staff	dr. R.F.G. Toonen, prof. dr. R.E. Koes

Teaching method(s)	Lecture, Seminar, Study Group
Level	600

Course objective
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.

Course content
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 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

Form of tuition
Lectures and masterclasses (~ 58 hrs).
Self study (~ 55 hrs)

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

Course reading
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.

Entry requirements
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

Target group

Master students: Biomolecular Sciences, Biology, Biomedical Sciences

Ethics in Life Sciences

Course code	AM_470707 ()
Period	Period 3
Credits	3.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	prof. dr. J.T. de Cock Buning
Examinator	prof. dr. J.T. de Cock Buning
Teaching staff	prof. dr. J.T. de Cock Buning, dr. J.F.H. Kupper
Teaching method(s)	Lecture, Study Group
Level	400

Course objective
To provide a toolbox of ethical instruments to analyze properly moral problems related (to one's own) research in the life sciences
• To acquire conceptual knowledge of the central concepts in applied philosophy and professional ethics
• To challenge an ethical reflection on one owns life science specialization and to open it for an impartial and constructive discussion
• To exercise a team based project to enter prepare and execute 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

Course content
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 small group training project, an ethical dialogue is prepared and executed together with another team.

Form of tuition
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
• Presentation : 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.

Type of assessment
• Degree of intellectual participation in the workgroups (10%)
• exam (50%) has to be passed
• written and verbal execution of the ethical dialogue (40%)

Course reading
Available on Blackboard

Entry requirements
Bsc Biology, Biomedical Sciences, Psychology with profile Biological Psychology or Neuropsychology

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

Remarks
Lectures in English, part of the workgroups are in Dutch. All presentations and plenary discussions in English.
In order to maximize the experience of differences in values and preferences, and this increase meaningful ethical inquiry we will place you randomly in the workgroups. Placement will be communicated after the introduction lecture.

Extension Practical Training

Course code	M_CEXTENS09 (3120035)
Period	Ac. Year (September)
Credits	3.0
Language of tuition	English
Faculty	VUmc
Coordinator	dr. E. Kanters
Examinator	dr. E. Kanters
Level	500

Registration procedure
The board of examiners has to give its approval of all practical training periods and the literature study. Forms and guidelines for practical training periods can be downloaded from the faculty website. Unapproved practical training periods will not be registered by the educational secretarial office. Possible financial consequences will be recovered from the student.

Genomes and Gene Expression

Course code	AM_470614 ()
Period	Period 1
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	dr. J.M. Kooter
Examinator	dr. J.M. Kooter

Teaching staff	dr. J.M. Kooter
Teaching method(s)	Lecture, Study Group,
Level	400

Course objective
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

Course content
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

Form of tuition
- 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)

Type of assessment
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.

Course reading
• 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

Entry requirements
Basic concepts in Molecular Biology, Genetics, and Biochemistry

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

Registration procedure
Enrollment through studentportal: Vunet.vu.nl

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

Life Cell Imaging

Course code	M_CLIFECE09 (3120008)
Period	Period 3+4+5
Credits	3.0
Language of tuition	English
Faculty	VUmc

Coordinator	dr. R.J.P. Musters
Examinator	dr. R.J.P. Musters
Teaching method(s)	Lecture, Study Group
Level	500

Course content
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.

Course reading
Syllabus including relevant articles.

Registration procedure
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.

Remarks
Contact: r.musters@vumc.nl

Major Internship

Course code	M_CMAJORI09 ()
Period	Ac. Year (September)
Credits	36.0
Language of tuition	English
Faculty	VUmc
Coordinator	dr. E. Kanters
Examinator	dr. E. Kanters
Level	500

Registration procedure
The board of examiners has to give its approval of all practical training periods and the literature study. Forms and guidelines for practical training periods can be downloaded from the faculty website. Unapproved practical training periods will not be registered by the educational secretarial office. Possible financial consequences will be recovered from the student.

Major Internship 36

Course code	M_CMAJORI15 ()
Period	Semester 1, Semester 2
Credits	36.0

Language of tuition	English
Faculty	VUmc
Coordinator	dr. E. Kanters
Examinator	dr. E. Kanters
Level	500

Minor Internship

Course code	M_CMINORI09 ()
Period	Ac. Year (September)
Credits	21.0
Language of tuition	English
Faculty	VUmc
Coordinator	dr. W.J. van der Laarse
Examinator	dr. W.J. van der Laarse
Level	400

Registration procedure
The board of examiners has to give its approval of all practical training periods and the literature study. Forms and guidelines for practical training periods can be downloaded from the faculty website. Unapproved practical training periods will not be registered by the educational secretarial office. Possible financial consequences will be recovered from the student.

Minor Internship 30

Course code	M_CMINORI15 ()
Period	Semester 2
Credits	30.0
Language of tuition	English
Faculty	VUmc
Coordinator	dr. W.J. van der Laarse
Level	400

Pathophysiology of Heart and Circulation

Course code	M_CPATHO09 (3120014)
Period	Period 1
Credits	6.0
Language of tuition	English
Faculty	VUmc
Coordinator	dr. W.S. Simonides
Examinator	dr. W.S. Simonides
Teaching method(s)	Lecture, Study Group
Level	400

Course objective
Obtaining a thorough understanding of cardiovascular function and the role of the underlying molecular components and mechanisms in the development of cardiac pathology.

Developing skills in critically reading research papers; formulating a new research concept; presenting the results of a study in a conference setting and writing a lay summary.

Course content
This course focuses on the fundamental aspects of normal cardiac function, cardiac dysfunction and the development of heart failure. The physiology of the heart and the circulation in health and disease will be addressed, with emphasis on the molecular mechanisms involved. Note: This is an advanced course and basic knowledge of cardiac structure and function is required to complete the course successfully.

The following topics will be addressed:

• circulation and blood pressure
• fluid dynamics
• electrophysiology
• cardiac contractile function
• cardiac remodelling and heart failure
• cardiomyopathies
• cardiac signal transduction and gene regulation
• mitochondrial function in heart failure

Form of tuition
Written exam and assignments.

Course reading
Book: Pathophysiology of Heart disease. Ed. L.S. Lilly 5th ed.
Various research articles and selected Chapters from Cardiology. Ed. Crawford-Di Marco-Paulus 3rd ed.

Registration procedure
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.

Proteomics in Biomedical Research

Course code	M_CPROTBI09 (3120006)
Period	Period 3+4+5
Credits	3.0
Language of tuition	English
Faculty	VUmc
Coordinator	prof. dr. J. de Groot-van der Velden
Examinator	prof. dr. J. de Groot-van der Velden
Teaching method(s)	Lecture, Study Group
Level	500

Course objective
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. Detection of these protein changes may provide candidate biomarkers and targets for therapeutic interventions. The present course will provide a solid basis for the understanding and the quantification of the diversity in protein identification by mass spectrometry and the different methods to detect and quantify cellular protein changes. In the second week, experience is
gained with gel electrophoresis and mass spectroscopy techniques to identify and quantify isoform expression and the nature and extent of post translational modifications.

Course content
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).

Course reading
Syllabus including relevant articles

Registration procedure
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.

Remarks
Contact:
Dr. Connie R. Jimenez
Associate Professor, Head OncoProteomics Laboratory
Dept. Medical Oncology
e-mail: c.jimenez@vumc.nl

Radiation Protection Course, Level 5B

Course code	M_CRADPRO09 (311164)
Period	Ac. Year (September)
Credits	3.0
Language of tuition	English
Faculty	VUmc
Coordinator	G.W.M. Visser BSc
Teaching method(s)	Lecture, Study Group
Level	500

Course objective

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.

Form of tuition
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 futural radiological activities. Participants shall receive a certificate as proof of their participation at 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 the Vrije Universiteit / VUmc.

Type of assessment
Written exam, twice a year. Only students who pass the Dutch 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.

Registration procedure
Current information on how to register for this course is available at the website from the Radionuclide Center at www.rnc.vu.nl (under Course). The course is meant for researchers who will (soon) work with radioactivity.

Remarks
For each course the maximal number of participants is 12. During the year 4 courses (twice in Dutch, twice in English) are given. During the year the possibility of 3 extra courses exists provided the number of participants is at least 8. See for more information: http://www.rnc.vu.nl
M.C. Stolker-Bouknecht is the administrator of the RNC-course, Tel: 020-4449101, mstolker@rnc.vu.nl. N.B. People who do want to do the course but do not understand Dutch, are before application requested to contact: G.W.M. Visser, coordinator of the course, Tel: 020-4449710, gvisser@rnc.vu.nl

Remodelling of the Circulatory System

Course code	M_CREMODE09 (3120001)
Period	Period 2
Credits	6.0
Language of tuition	English
Faculty	VUmc
Coordinator	prof. dr. J.W.M. Niessen
Examinator	prof. dr. J.W.M. Niessen
Teaching method(s)	Lecture, Study Group
Level	400

Course content
This course focuses on the pathophysiological mechanisms of vascular remodelling.

The following topics will be addressed:
*atherosclerosis: pathology, imaging and animal models
*cell biology: endothelial cells, smooth muscle cells and adventitia
*immunology: the role of neutrophilic granulocytes, lymphocytes and macrophages
*angiogenesis/arteriogensis: basic and clinical aspects
*vascular aneurysm: basic and clinical aspects
*therapy: venous bypass, stem cells and antibody therapy
*vascular aspect of pregnancy

The course contains the following practical element:
• journal club

Course reading
relevant articles

Registration procedure
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.

Remarks
Contact: j.w.m.niessen@vumc.nl

Research Ethics

Course code	M_FETHICA14 ()
Period	Period 3+4+5
Credits	3.0
Language of tuition	English
Faculty	VUmc
Coordinator	prof. dr. G.A.M. Widdershoven
Examinator	prof. dr. G.A.M. Widdershoven
Teaching method(s)	Lecture, Study Group
Level	500

Study of Literature

Course code	M_CLITSTU09 (3120036)
Period	Ac. Year (September)
Credits	9.0
Language of tuition	English
Faculty	VUmc
Coordinator	dr. E. Kanters
Examinator	dr. E. Kanters
Level	500

Registration procedure
The board of examiners has to give its approval of all practical training periods and the literature study. Forms and guidelines for practical training periods can be downloaded from the faculty website. Unapproved practical training periods will not be registered by the educational secretarial office. Possible financial consequences will be recovered from the student.

Vascular Function and Metabolic Diseases

Course code	M_CVASCFU09 (3120002)
Period	Period 2
Credits	6.0
Language of tuition	English
Faculty	VUmc
Coordinator	dr. E.H. Serné
Examinator	dr. E.H. Serné
Teaching method(s)	Lecture, Study Group
Level	400

Course objective
This course focuses on the interplay between vascular function and metabolic disease. Pathophysiology, new diagnostics and development of new therapies will be presented.

Course content
The following topics will be addressed: chronic kidney disease and vascular disease , diabetes and (micro)vascular dysfunction; Microbial modulation of insulin sensitivity; Rheumatic disease and vascular disease; Surrogate markers for cardiovascular disease, sepsis and (micro)vascular failure.
The course contains the following practical elements: in vivo assessment of vascular function in humans; hemodynamics/vital functions during reanimation, literature assignment, participation in 5th symposium of the Rembrandt Institute of Cardiovascular Science.

Type of assessment
Written exam and assignments

Course reading
Book: to be announced;
syllabus including relevant articles.

Registration procedure
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.

Writing Scientific English

Course code	M_FWSE09 (3120015)
Period	Semester 2

Credits	3.0
Language of tuition	English
Faculty	VUmc
Coordinator	drs. J.K.A. Meijer
Examinator	drs. J.K.A. Meijer
Teaching method(s)	Seminar
Level	400

Course objective
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.

Course content
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

Form of tuition
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.

Type of assessment
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.

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

Target group
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.

Registration procedure

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.

Remarks
- 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