MA Oncology

VU University Amsterdam - VUmc - M Oncology - 2015-2016

This study guide contains information about the Master's Programme in Oncology organized 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

Cancer is one of the main causes of death in the Western world. In our ageing society the number of cancer patients continues to rise, since the incidence of the disease is highest among the elderly. Research in order to prevent, diagnose and treat this disease is therefore of vital importance. The same applies to research into the causes of cancer and the long-term effects of treatment. Cancer research is multidisciplinary and takes place within a global network. A researcher in such a demanding environment needs to be well equipped.

The Master's Programme in Oncology aims to transfer the unique combination of fundamental and translational oncology research at the VUmc to the next generation of students. The programme is research-oriented and has a multidisciplinary character. Students are trained in state-of-the-art techniques in cancer research and therapy. The programme also aims for education of skills for being able to develop, organize and perform oncological research.

Structure and Content of the programme

The Master Oncology trains you to become a MSc in Oncology with in depth knowledge, attitudes and skills in the field of cancer research. This includes the development, execution, organization and evaluation of scientific research. The duration of your programme is two years (120 EC) and completely taught in English. The two years consist of the following components: *compulsory courses, optional courses, a study of literature and two practical training periods*. The practical training period consists of a minor and major internships together counting for 66 EC in total. The major internship automatically will be your Master Thesis. The final Master Examination consists of all assessed items, which in practice means that all examinations will be added up to a total of 120 EC. The board of examiners eventually decides whether your Master Examination is finished successfully.

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 Master's Programme in Oncology
Dr. Marjan M. van Duist, PhD
Telephone: 020-4446345
Email: masteroncology@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 in items to be examined

Compulsory courses

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

Optional courses

Students have to have a consent from the examination board, if they want to attend an optional course. A 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.
A 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 Oncology - Optional Courses

The optional courses in oncology are intended to deepen the knowledge acquired in the compulsory courses. These options cover both theoretical and practical aspects of oncology. 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.

Courses:

Name	Period	Credits	Code
Advanced Molecular Immunology and Cell Biology	Period 1	6.0	AM_470656
Biophotonics I: Microspectroscopy	Period 3	3.0	AM_470629
Biophotonics III: Practical Training	Period 3	3.0	AM_470630
Caput Epigenetics	Ac. Year (September)	6.0	AM_470606
Caput Structural Biology	Ac. Year (September)	6.0	AM_470607
Clinical Immunology	Period 2	6.0	AM_470655
Extension Practical Training	Ac. Year (September)	3.0	M_OEXTENS03
Genomes and Gene Expression	Period 1	6.0	AM_470614
In the Footsteps of Antoni van Leeuwenhoek	Ac. Year (September)	3.0	M_OANTONI03
Life Cell Imaging	Period 3+4+5	3.0	M_CLIFECE09
Macroscopic, Microscopic and Pathological Anatomy of the Mouse	Ac. Year (September)	3.0	M_OMACROS03
Medical Imaging	Period 4	6.0	X_428526
Protein Science	Period 1	6.0	AM_470145
Proteomics in Biomedical Research	Period 3+4+5	3.0	M_CPROTBI09
Radiation Protection Course, Level 5B	Ac. Year (September)	3.0	M_ORADPRO04
Research Ethics	Period 3+4+5	3.0	M_FETHICA14
Science and Communication	Period 1	6.0	AM_470587
Science Journalism	Period 2	6.0	AM_471014
The Symbolic and Cultural Meanings of Cancer	Ac. Year (September)	3.0	M_OSYMBOL04
Viral Oncogenesis	Period 4	3.0	M_OVIRONC03

Master Oncology - Compulsory Courses

The first semester of the programme is filled with compulsory courses which will give you the basic knowledge about the main themes in cancer development, research and treatment. The last two courses will help you improve your academic skills. Master Oncology students need to at least positively conclude three of the first four oncology compulsory courses to start their internship or literature study.

Programme components:

- Academic Core Oncology

Courses:

Name	Period	Credits	Code
Biostatistics oncology	Period 3	3.0	M_OBIOSTA14
Innovative Tumor Therapies	Period 2	6.0	M_OITT03
Oncogenesis	Period 1	6.0	M_OONC03
Tumor Biology and Clinical Behaviour	Period 2	6.0	M_OTBCB03
Tumor Immunology	Period 1	6.0	M_OTUMIM10
Writing Scientific English	Semester 2	3.0	M_FWSE09

Academic Core Oncology

Courses:

Name	Period	Credits	Code
Academic Core Oncology 1st year	Ac. Year (September)	0.0	M_OACCOREA14
Academic Core Oncology 2nd year	Ac. Year (September)	3.0	M_OACCOREB14

Master Oncology - Internships

In total, you have to spend 66 EC credit points for two internships: a minor (27-33 EC) and a major (33-39 EC). Both internships have to be performed at a research laboratory, acknowledged by the examination board of the Master in Oncology: The minor internship has to be performed at one of the of the OOA Oncology Graduate School laboratories (including VU/ Vumc, NKI, AMC, Sanquin) the major internship can also be done outside this area. We strongly stimulate students to do an internship abroad, but in all cases the internship needs to be approved by the examination board. All regulations regarding internship and needed forms can be found on www.med.vu.nl. These regulations counts for all students which started their Master's Programme in Oncology in 2012 or later

Courses:

Name	Period	Credits	Code
Major Internship	Ac. Year (September)	33.0	M_OMAJORI12
Minor Internship	Ac. Year (September)	27.0	M_OMINORI12

Master Oncology - Study of Literature

Your literature study needs to be approved by the examination board. For approval you need to fill out the approval form for a literature study. Finish the form as completely as possible to allow the examination board to make a proper assessment of your request. For more information about the Literature study check out the Regulations for Literature Study document and needed forms on the faculty website.
When your literature study is finished and assessed by your examiner you need an assessment form. You also need to give an oral presentation at the department of your supervisor/assessor. The total mark consists of 10% for the research outline, 70% report and 20 % oral presentation. You can find all needed forms and regulations for Literature Study at www.med.vu.nl. After handing in your literature study at the administration office, the report will be reviewed and graded by an independent examiner. The final mark of the written report will be the average of the individual marks for the report given by the examiners.

Courses:

Name	Period	Credits	Code
Study of Literature	Ac. Year (September)	9.0	M_OLITSTU03

Academic Core Oncology 1st year

Course code	M_OACCOREA14 ()
Period	Ac. Year (September)
Credits	0.0
Language of tuition	English
Faculty	VUmc
Coordinator	M.M. van Duist
Examinator	M.M. van Duist
Teaching method(s)	Seminar
Level	400

Academic Core Oncology 2nd year

Course code	M_OACCOREB14 ()
Period	Ac. Year (September)
Credits	3.0
Language of tuition	English
Faculty	VUmc
Coordinator	M.M. van Duist
Examinator	M.M. van Duist
Teaching method(s)	Seminar

Level	500

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.

Biophotonics I: Microspectroscopy

Course code	AM_470629 ()
Period	Period 3

Credits	3.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	dr. ir. Y.J.M. Bollen
Examinator	dr. ir. Y.J.M. Bollen
Teaching staff	prof. dr. ir. E.J.G. Peterman, dr. ir. Y.J.M. Bollen
Teaching method(s)	Lecture
Level	400

Course objective
To introduce students into various spectroscopic and microscopic techniques.
Students should know the theoretical principles and the applicability in life sciences of:
- absorption spectroscopy
- fluorescence spectroscopy
- light microscopy
- fluorescence microscopy

Course content
Optical spectroscopy and microscopy are widely used in cell biology and biophysics. In this course the principles of many of these techniques, including absorption spectroscopy, various types of fluorescence spectroscopy (e. g. polarization, FRET) and fluorescence microscopy (e. g. confocal, TIRF, lifetime imaging) are explained. Their application in modern biophysics and cell biology research is illustrated by a number of (guest) lecturers.

Form of tuition
Lectures (28 hours), group assignment (8 hours), self-study

Type of assessment
Written exam (75%), oral presentation by group (25%). Both parts need to be passed (with a grade of 5.5 or higher) in order to pass the course.

Course reading
Notes, handouts and papers

Target group
MSc students Biology, Biomolecular Sciences, Biomedical Sciences, Medical Natural Sciences, Physical Sciences, Chemistry, or related.

Remarks
Due to largely overlapping contents this course is NOT intended for students who have taken the FEW BSc course “Microscopische beeldvorming (X_420529)”.
Practical training in the techniques discussed here is offered in Biophotonics 3, for which Biophotonics 1 is required.

Biophotonics III: Practical Training

Course code	AM_470630 ()
Period	Period 3
Credits	3.0

Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	dr. ir. Y.J.M. Bollen
Examinator	dr. ir. Y.J.M. Bollen
Level	400

Course objective
To introduce students into the application of various optical techniques, mainly fluorescence spectroscopy and microscopy.
Students should be able to:
- plan and conduct experiments using optical techniques
- evaluate results on the basis of theoretical knowledge and recent literature
- present their results in short reports and one journal-style paper

Course content
Optical spectroscopy and microscopy are widely used in cell biology and biophysics. In this course students will obtain hands- on experience with absorption spectroscopy, fluorescence spectroscopy (e. g. FRET and anisotropy) and fluorescence microscopy. The theory behind these techniques is already given in Biophotonics 1, which is required to enter this course. Small groups of students will prepare the experiments, discuss them with the lecturer and carry them out. The group will write a short report on each experiment and one journal-style paper.

Form of tuition
Experiments (±24 hours) are performed in small groups. Experiments need to be prepared and reports need to be written.

Type of assessment
Participation during labwork and discussion (individual; 30%); written report (per group; 70%).

Course reading
Papers and protocols that will be made available through Blackboard

Entry requirements
Biophotonics: Microspectroscopy (AM_470629) or Microscopische beeldvorming (X_420529) are required to enter this course.

Target group
MSc students Biology, Biomolecular Sciences, Biomedical Sciences, Medical Natural Sciences, Physical Sciences, Chemistry or related.

Remarks
The theoretical background of the techniques used here is discussed in Biophotonics: Microspectroscopy (AM_470629).

Biostatistics oncology

Course code	M_OBIOSTA14 ()
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;
• analysis of survival data: Kaplan Meier curves and Cox regression analysis;
• multiple regression analysis: association and prediction models;
• repeated measures analysis: repeated measures ANOVA.

Form of tuition
The course consists of seven lectures, seven exercise classes and self-study. In the exercise classes students will actively apply the discussed methods to several datasets using the statistical software SPSS.

Caput Epigenetics

Course code	AM_470606 ()
Period	Ac. Year (September)
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	dr. J.M. Kooter
Examinator	dr. J.M. Kooter
Level	500

Course objective
Course objectives:
At the end of the course, the student:
- is able to describe in detail the structure and composition of Chromatin, the post-translational modifications of chromatin proteins, where these modified proteins can be found in chromosomes, and how they are somatically inherited
- is able to indicate the enzymes responsible for the modifications and how they are regulated and targeted to specific genomic regions
- can recognize the dynamic nature of chromatin and epigenetic protein modifications, and is able to identify the 'readers' of the modifications and their consequences
- can describe the biochemical mechanisms of transcriptional regulation,

including the process of transcription initiation, elongation and termination
- can describe the various DNA modifications, their biochemistry, and impact on genome maintenance and gene expression in somatic tissues, including brain
- can describe the epigenetic reprogramming events during mammalian embryonic development, parental imprinting, and biological consequences
- recognize cases of genetic - and epigenetic inheritance, and transgenerational inheritance
- can indicate and explain the molecular causes of human diseases, including cancer, that are due to aberrant epigenetic features and defective epigenetic mechanisms
- is able to identify phenomena that are due to environmentally-induced changes in epigenetic genome properties
- can explain the link between nutrition and epigenetic modifications
- can apply currently used experimental approaches and techniques to study epigenetics and is able to interpret the results

Course content
The following topics are discussed:
• Non-Mendelian inheritance of traits
• Biochemistry of DNA methylation and de-methylation
• Composition of chromatin and chromatin remodeling
• Biochemistry of histone modifications and chromatin structure
• Somatic and gametic cell inheritance of epigenetic information
• Cellular memory and chromatin modifications by the polycomb-group proteins
• Role of DM&CM in gene expression and genome maintenance
• Role of epigenetics in cancer and other diseases
• Role of DM&CM in sex-chromosome inactivation and activation
• Parental imprinting and gene dosage compensation
• Epigenetic reprogramming events during mammalian development
• Stem cells and reprogramming
• Functions of non-coding RNAs / RNA interference in DM&CS
• Neurobiology and epigenetics
• Epigenetic effects of diet, nutrition, drugs and environmental 'factors', including toxicants and behavior
• Transgenerational effects: inheritance of epigenetic-based traits
• Does epigenetics play a role in evolution?
• Methods that are currently used to analyze DM&CM

Form of tuition
- No regular lectures, mostly self-study
- Studying recent review and research articles (ca 120 hr)
- Weblectures by experts (ca 10 hr)
- Discussion meetings (1-2 per week) in which the topics of the research and review articles are discussed (ca 15 hr)

Type of assessment
Written exam

Course reading
- Basics: Molecular Biology of the Cell by Alberts et al., sixth edition: Chapters on DM&CM and transcriptional control of gene expression

- Recent Review and Research articles, which will be provided via Blackboard.

Entry requirements
Bachelor level Biochemistry, Molecular Genetics and Molecular Biology

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

Registration procedure
Email to Coordinator: j.m.kooter@vu.nl

Remarks
In exceptional cases, it is possible to develop a more 'personalized' program, depending on previous courses and the knowledge of epigenetics.

Lecturer:
dr. Jan M. Kooter

Caput Structural Biology

Course code	AM_470607 ()
Period	Ac. Year (September)
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	dr. ir. Y.J.M. Bollen
Examinator	dr. ir. Y.J.M. Bollen
Level	500

Course objective
To obtain knowledge about a topic in the field of protein structure and protein dynamics that currently attracts a lot of attention. To learn how to present and discuss scientific research.

Course content
One of the following topics:
- Adaptation of microorganisms to extreme environments
- Prion proteins
- Fluorescent proteins

Form of tuition
Self study, contact with lecturer is possible following an appointment

Type of assessment
Oral discussion with the lecturer

Course reading
A number of recent scientific papers will be provided

Entry requirements
See entry requirements for the specified MSc programs.

Target group
MSc students "Biology", "Biomolecular Sciences" and "Biomedical Sciences"

Remarks
The oral discussion with the lecturer can be done in English or in Dutch.

Clinical Immunology

Course code	AM_470655 ()
Period	Period 2
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	dr. T. van der Pouw Kraan
Examinator	prof. dr. Y. van Kooyk
Teaching staff	drs. K. Brouwer, dr. C.J.J. Mulder, dr. T. van der Pouw Kraan, dr. B.W. van Oosten, dr. J. Killestein, prof. dr. P. van der Valk, dr. ing. S.J. van Vliet, dr. E.J.G. Peters, H.E. Hulst
Teaching method(s)	Lecture
Level	500

Course objective
To understand immunopathogenic processes that play a role in the onset and chronicity of three immunological diseases, which cover auto-immunity and infectious disease, such as celiac disease, multiple sclerosis (MS) and AIDS.
To acquire insight in both clinical parameters as well as basic scientific principles that play a role in these diseases.
To acquire insights in the currently used treatments to reduce disease activity.
To understand the mechanism by which the immune system regulates these diseases, and how one could modify immune response to the benefit of the patient.
To apply the acquired knowledge of scientific literature and scientific hypotheses of each of the topics described above by presenting it to their fellow students.

Course content
During the course three immunological diseases will be discussed: celiac disease, multiple sclerosis (MS) and AIDS, each for the duration of one week. Each week will start with a clinical introduction into the features of the disease by a practicing clinician at the VUmc, who illustrates the symptoms in patients that have these diseases. Questions will be formulated and within small groups students will formulate answers through literature search. During the week more lectures will be given on the immunological mechanisms that play a role during these complex diseases. These lectures highlight molecular immunological tools used, as well as novel strategies such as genomics-proteomics profiling of the disease, the use of animal models that mimic disease, as well as vaccine development and treatment methodology of the diseases. Through self study and searching

literature, students will try to answer the questions via an oral presentation for their fellow students,
which is scheduled at each Friday.

Form of tuition
The course covers immunological processes as well as clinical parameters both at the molecular as well as the cellular level and will discuss both innate and adaptive immune responses. The course consists of lectures, selfstudy, and workshops. Lectures and workshops both are compulsory. In the latter part students will present their answers on questions based on literature searching and reading of reviews as well as the lectures. For the duration of one week one disease will be discussed, whereas the last week covers mainly selfstudy and the exam.

Contact hours
19 hours lectures
15 hours workgroups and presentations

Type of assessment
Lectures and workshops are compulsory and form part of the material that covers the exam. Active participation in discussion is part of the appraisal (presentations of answers to assay questions account for 10% of the exam). Written exam at the end of week 4 include 15 essay questions (90%).

Course reading
The immune system by P. Parham 3th edition, Immunobiology by Janeway 7th edition, Case Studies in Immunology: A Clinical Companion (by Geha 6th edition), including a handout on BB which contains recent reviews specialized
on the immunological diseases discussed.

Entry requirements
Bachelor's course Immunology

Target group
MSc students with a keen interest to study immunological processes within the complexity of diseases such as allergy, multiple sclerosis and AIDS.

Remarks
External lecturers:
Dr. J. Borghans (UMCU)
Prof. dr. F. Koning (LUMC)
Dr. J. Samsom (ErasmusMC)
Dr. W.A. Paxton (AMC)
Prof. dr. T.B.H. Geijtenbeek (AMC)
Prof. dr. B het Hart (UMCG)

Extension Practical Training

Course code	M_OEXTENS03 (311166)
Period	Ac. Year (September)
Credits	3.0
Language of tuition	English
Faculty	VUmc

Coordinator	M.M. van Duist
Examinator	M.M. van Duist
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.

Remarks
Extension Practical Training has 3 or 6 ECTS.

A placement can be elongated with 6 ECTS credit points at once, coming from credits to use either for an once-only elongation of a placement or an extra optional course. This elongation has to be approved of separately via a form of approval for the filling in of credit points out of free space. The mark for the extension is the same as the mark for the placement. Elongation will only be accepted if this will lead to more scientific results and if it strokes with the student's planning. Elongation to compensate low quality will not be tolerated.

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.

In the Footsteps of Antoni van Leeuwenhoek

Course code	M_OANTONI03 (311169)
Period	Ac. Year (September)
Credits	3.0
Language of tuition	English
Faculty	VUmc
Teaching method(s)	Lecture, Study Group
Level	500

Course objective
A five day course covering the many possibilities of microscopy for research.

Course content
This course teaches you the application of a range of imaging possibilities within the Centre for Microscopy at the AMC, the VUmc and the NKI-AvL. They are presented in lectures, discussions and hands-on demonstrations. The individual research projects of the attending participants will be discussed in relation to the demonstrated techniques, allowing exchange of ideas with fellow participants and microscopy experts and operators. The course is a guide to implement cellular imaging in your own research project. A part of the participants could bring their sample for analysis after consulting with the organization first.

Topics covered include:
- basic principles of microscopy

- basic principles of confocal laser scanning microscopy
- specimen preparation and staining methods
- quantitative analysis of microscopic images (e.g. Image J)
- electron microscopy techniques
- live cell imaging (e.g. inverted automated fluorescence and Total Internal Reflection
Fluorescence)

Target group
This is a PhD-students' course organized by the "Onderzoeksschool Oncologie Amsterdam" (OOA). OOA courses are open for Master Oncology students as optional courses under certain conditions.

Registration procedure
For further information: http://www.ooa-graduateschool.org.
For registration: use application form on website (links available under Course programme on OOA website. Mail application to vumc-cca@vumc.nl"

Remarks
For course information and application: check the website www.ooa-graduateschool.org/cms/course-program/ or send e-mail to Esther Ruhé (e.ruhe@vumc.nl)

Innovative Tumor Therapies

Course code	M_OITT03 (311104)
Period	Period 2
Credits	6.0
Language of tuition	English
Faculty	VUmc
Coordinator	prof. dr. G.J. Peters
Examinator	prof. dr. G.J. Peters
Teaching method(s)	Lecture, Seminar
Level	400

Course objective
After completion of the course the student will have acquired knowledge of and insight in the background of the treatment of cancer. The student has been given a broad overview of the development of theories in this field.

Course content
The contents of this course are largely determined by the latest developments in the field of research concerning cancer therapies. Depending on these developments, the course program can be adjusted at any time.

Topics:
• Targeted therapy
• Personalized
• Metabolism
• Pharmacodynamics/pharmacogenomics
• gene therapy and RNAi
• radiotherapy
• antibody therapy

• angiogenesis
• clinical trials
• social and psychosocial aspects

Form of tuition
38 hours (12 working group, 20 active participation, 6 demonstration). The course will be given in English. Students are required to have a large self-motivation. The course will be highly interactive and will consist of contact hours with a teacher and project groups in which recent publications are being discussed. Excursions will be incorporated, in which one type of therapy is topic of study.
Workgroup and lectures: recent publications are being discussed.
Active participation: project writing and presentation. Students are required to have a large self-motivation. The course will be highly interactive.
Patient demonstrations: excursions will be incorporated, in which one type of anti cancer therapy is topic of study.

Type of assessment
The exam will consists of the material presented during the lectures, selected course reading and selected chapters from Weinberg's book.

The project will get a separate assessment.

Course reading
The course material will consist of recent reviews in the field of innovative therapies, which will be handed out at the start of the course.

Target group
This course is compulsory for students of the Master in Oncology.

Remarks
The student will have acquired knowledge of the latest developments in the field of cancer treatment and will have acquired insight in the development of theories.
The student will be able to integrate his/hers acquired knowledge of and insight in the formation of opinions concerning research questions in this field.

Coordinators: Prof. Dr. A.W. Griffioen en Dr. E. Giovannetti

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

Macroscopic, Microscopic and Pathological Anatomy of the Mouse

Course code	M_OMACROS03 (311163)
Period	Ac. Year (September)
Credits	3.0
Language of tuition	English
Faculty	VUmc
Teaching method(s)	Lecture, Study Group
Level	500

Course objective
This course aims to provide a practical understanding of the anatomy and histology of what is currently the most frequently used experimental animal, the house mouse. In addition, it focuses on recognition of pathological changes in the mouse.

Most biomedical PhD students perform animal experiments at some stage of their research career, but most students have never had practical instructions with respect to anatomy, histology and pathological anatomy of experimental animals.
For this reason, experimental animals are usually not subjected to a thorough and systematic inspection to assess whether, besides the local (expected) effects in the organ(s) under study, other organs are affected as well. The present course aims to provide practical insight (s) in the anatomy and histology of the mouse, presently the most frequently used experimental animal. In addition, the course focuses on recognition of pathological changes in the mouse.

Course content
The subjects covered are:
1. Anatomy of the adult male and female mouse
2. Microscopic and pathological anatomy of tissues and organs

3. Dealing with pathologically changed animals
4. Developmental and neuro-anatomy
5. Selection of mouse models
6. Quantification of pathological changes.

Most biomedical PhD students perform animal experiments at some stage in their research career, but few have ever received any practical instruction concerning the anatomy, histology, and pathological anatomy of experimental animals. For this reason, the animals are not usually subjected to a thorough and systematic inspection to assess whether other organs, not just those being studied in the experiment, are affected as well.

Each student dissects a mouse to learn this species' topographic anatomy. The microscopic component focuses on studying and understanding the architecture of normal and pathologically changed mouse tissues. The practical component involves the recognition of cell and tissue types, as well as of changes in the architecture of tissues as a result of pathological processes, under the microscope. Standard staining techniques are demonstrated, as are functional ones.

Topics
Independent study (approx. 120 hrs), complemented with training sessions.
First, during the initial lecture knowledge on the first 9 chapters will be refreshed and rehearsed. Subsequently, the chapters 10 -16 of Parham (2nd ed.) and research models in immunity and disease will be lectured and discussed. Moreover, small-scale working group sessions are scheduled to provide highly interactive discussions on recent literature selected in order to highlight cutting edge research questions (2 x 3 hours).

Target group
This is a PhD-students' course organized by the "Onderzoeksschool Oncologie Amsterdam" (OOA). OOA courses are open for Master Oncology students as optional courses under certain conditions.

Registration procedure
For further information: http://www.ooa-graduateschool.org. For registration: use application form on website (links available under Course programme on OOA website. Mail application to vumc-cca@vumc.nl.

Remarks
For further information: www.ooa-graduateschool.org/cms/course-program/
For registration: use application form (Course Link: Course Documents / Important Forms > concerning Placement and Study of Literature / Forms for Approval) to Esther Ruhé-Hoogervorst (e.ruhe@vumc.nl)

Major Internship

Course code	M_OMAJORI12 ()
Period	Ac. Year (September)
Credits	33.0
Language of tuition	English
Faculty	VUmc

Coordinator	dr. ir. V.L.J.L. Thijssen
Examinator	dr. ir. V.L.J.L. Thijssen
Level	500

Course objective
The major internship is the final pratical training within the master programme and consists of at least 33 EC with a maximum of 39 EC. The aim of the major internship is to opbtain in depth knowlegde and practice of a certain oncology research.

Course content
The major internship can be carried out within or outside the VU/VUmc. The internship must be performed in a oncology research related topic. The results of the major internship integrated with the knowlegde obtained acquired during the compulsory education forms the master thesis.
The master thesis will be defended in public. Whem performing the practical components students must adhere to the faculty's safety regulations.

Form of tuition
Practical work, presentation, report, work discussion etc.

Type of assessment
• For the major placement a student always has to ask for approval of the examination board of the Master's Programme in Oncology via the form, which can be found on www.med.vu.nl. This form should be filled in together with the supervisor and assessor, and contains detailed information on the internship. The submission of the form to the examination board is the responsibility of the master student.

• After 6 weeks an interim assessment has to be made by the assessor and the supervisor. This 6 week period concludes the trial period. An assessment has to be made regarding the possibility to successfully finish the placement within the given timeframe.

• At the end of a placement: for each part a partial mark will be given. The final mark is calculated, using the norm 50-25-25% for respectively laboratory practise, final report and oral presentation. The final judgement will be executed in the presence of the supervisor, assessor aand the student.

Course reading
A student is expected to learn and carry out scientific research under supervision and in a later stadium more independently. During the internship also included in the learning objectives are theoretical preparation, literature search, planning of expirements, writing of the final report, work discussions and participating in scientific activities at the department.

Remarks
A student is expected to read and process Scientific articles relevant to the internship.For more information check out the regulations on the faculty
website.

Medical Imaging

Course code	X_428526 (428526)
Period	Period 4
Credits	6.0
Language of tuition	English
Faculty	Faculteit der Exacte Wetenschappen
Level	400

Course content
http://studiegids.uva.nl/xmlpages/page/2015-2016/zoek-vak/vak/14926

Remarks
This course is offered at the UvA. For more information contact: FNWI Education Service Centre, Science Park 904, servicedesk-esc-science@uva.nl, +31 (0)20 525 7100.
Enrolment via https://m.sis.uva.nl/vakaanmelden is required.

Minor Internship

Course code	M_OMINORI12 ()
Period	Ac. Year (September)
Credits	27.0
Language of tuition	English
Faculty	VUmc
Coordinator	dr. ir. V.L.J.L. Thijssen
Examinator	dr. ir. V.L.J.L. Thijssen
Level	400

Course objective
The minor internship is the first practical training within the master programme and consists of at least 27 EC with a maximum of 33 EC. The aim of the practical training is to obtain hands on experience in performing
scientific research.

Course content
The minor placement needs to be carried out within one of the laboratories of the oncology graduate school OOA (VU/VUmc, NKI, Sanquin, AMC). The placement can be performed in a field related to oncology research. When performing the practical components, students must adhere to the faculty's safety regulations.

Form of tuition
Practical work, presentation, report, work discussion etc.

Type of assessment
• For the minor placement a student always has to ask for approval of the examination board of the Master's Programme in oncology via the form which can be found on the faculty website. This form should be filled in together with the supervisor and assessor and contains detailed information on the internship. The submission of the form to the examination board is the responsibility of the master student.

• After 6 weeks an interim assessment has to be made with the assessor r

and the supervisor. This 6 week period concludes the trial period. An assessment has to be made regarding the possibility to successfully finish the placement within the given timeframe.

•At the end of a placement for each part a partial mark will be given. The final mark is calculated, using the norm 50-25-25% for laboratory practise, final report and oral presentation respectively. The final judgement will be executed in the presence of the supervisor, the assessor and the student.

Course reading
A student is expected to learn and carry out scientific research under supervision and in a later stadium more independently. During the internship also included in the learning objectives are theoretical preparation, literature search, planning of expirements, writing of the final report, work discussions and participating in scientific activities at the department.

Remarks
A student is expected to read and process scientific articles relevant to the internship. For more information check out the regulations for internship on the faculty website.

Oncogenesis

Course code	M_OONC03 (311101)
Period	Period 1
Credits	6.0
Language of tuition	English
Faculty	VUmc
Coordinator	prof. dr. P.J.F. Snijders
Examinator	prof. dr. P.J.F. Snijders
Teaching method(s)	Lecture, Seminar
Level	400

Course objective
The aim of this course is to acquire knowledge of and insight in the general concepts of oncogenesis and basic tumor biology, which includes the different genetic alterations and classes of genes involved, their role in cellular signalling, DNA repair and cell cycle control, the (molecular) tools to study carcinogenesis including NextGen sequencing, transgenic mouse models and high-throughput functional genomics and model systems used in the field of oncogenesis. In addition, cancer predisposition syndromes, exogenous factors involved in oncogenesis with emphasis on viruses, and markers of progression, genetic counselling, screening, as well as intervention options will be studied.

The students will be given an up-to-date overview of the current knowledge and opinions in this exciting field. Furthermore, the students will acquire insight into how to interpret literature on specific topics in oncogenesis and present their findings in a clear and concise manner.

Course content
The course on Oncogenesis consists of three parts. The first part involves morning sessions with lectures given by experts on various

topics of oncogenesis. The second part involves a literature (self-) study on a specific familial cancer syndrome followed by a group-presentation in the last week of the course. The third part involves a repetition of some basic lectures for which students will summarize lectures with the aid of the handouts that will become available on Blackboard. The latter two parts will be executed by groups of 4 students in a way that all students will be involved in a presentation.

Topics include:
1. Cell cycle, signaling and cancer genes
2. Cancer genetics and epigenetics
3. Mechanisms and models
4. Viruses causing cancer
5. Clinical aspects
6. DNA repair, clinical genetics and predisposition syndromes

Form of tuition
± 50 interactive lectures given by experts during morning sessions
± 6-7 interactive lecture repetitions given by student groups
± 6-7 interactive literature presentations given by student groups
The course has approximately 47.5 contact hours with teachers and course coordinators.

Type of assessment
The course will be concluded with a 3 hours examination (24 open questions)on the contents of the lectures. Also the lecture repetitions and presentations of the literature studies will be judged and the final mark of this course will be determined by the average of the scores for the examination (counting for 70%), The lecture repetition (counting for 10%), and the literature presentation (counting for 20%). Students need to be present and actively participate during the course. Absence is only allowed with reason and need to be reported on beforehand.

Handouts of the presentations, including those of the literature studies. (Review) articles posted on Blackboard can be consulted as reference work to facilitate studying the different subjects.

Course reading
The course reader (available on Blackboard) contains (review) articles on the various topics as well as handouts of the presentations of the lectures, chapters 3 to 12 of "The biology of Cancer" by Robert Weinberg.

Target group
This course is compulsory for students of the Master in Oncology.

Remarks
The students will have acquired insight in the latest developments in the field of oncogenesis and cancer genetics. Furthermore, the students will be able to integrate knowledge and insight in the formation of opinions concerning research questions about the development of cancer.

Coordinators:
Prof.dr. R.H. Brakenhoff
Dr. S. Cillessen
Dr. R. Wolthuis

Protein Science

Course code	AM_470145 ()
Period	Period 1
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	dr. D. Bald
Examinator	dr. D. Bald
Teaching staff	dr. M.H. Siderius, prof. dr. ir. E.J.G. Peterman, dr. J.N.M. Commandeur, dr. D. Bald, prof. dr. M.J. Smit
Teaching method(s)	Lecture, Study Group
Level	400

Course objective
The student:
1. knows and understands principles of protein structure,, dynamics, regulation, inhibition, interaction and engineering
2. can explain protein function based on protein structure and the proprties of amino acid residues.
3. can predict the function of (parts of) a protein based on undestanding of its molecular properties
4. knows and understands the principle of current methods for protein investigation (e.g. overproduction, purification, interaction, engineering)
5. can analyze the strong and weak points of Protein Science techniques and can correlate an open question with a suitable technique.
6. can analyze experiments in Protein Science and design new experiments.

Course content
We will start with a repetition of protein structure and function. Subsequently, we will focus on methods in protein science and also on more specialized properties of proteins important in fundamental research, biomedicine or biotechnology. Finally we will deal with case studies on selected proteins.
Lecture topics include:
Protein Structure, Protein Function, Protein Dynamics, Molecular Machines, Control of Protein Function, Protein inhibition, Antibiotic action, Development of antibiotics and antibiotic resistance, Protein over-expression and purification, Protein Interaction, Protein Engineering,
Molecular Modeling and docking
Case studies:
GPCRs as drug target, Cytochrome P450, Chaperones as Protein folding machines,
Molecular Modeling/docking.

Form of tuition
Lectures (30 h) accompanied by work (paper) discussions (6 h) and self study
(individual or in small groups) to prepare for the lectures and to discuss the material presented in lectures/accompanying papers.

Type of assessment
Written exam (100%)

Course reading
No special book required. Useful may be "Protein Structure and Function" by Petsko/Ringe. You can also use any Biochemistry textbook (e.g. Voet and Voet) for repetition. You will receive material (reviews and original articles on relevant topics). Examples of scientific literature: Lee et al. Nature 2010, Bax et al. Nature 2010, and Kumar Exp. Opin. Drug Metab 2010.

Target group
Masters students Biomolecular Sciences, Biomedical Sciences, Biology, Pharmaceutical Sciences and Medical Natural Sciences

Remarks
Visiting lecturer: Dr. Anil Koul, Tibotec J&J

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_ORADPRO04 (311164)
Period	Ac. Year (September)
Credits	3.0
Language of tuition	English
Faculty	VUmc
Coordinator	G.W.M. Visser BSc
Teaching method(s)	Lecture
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 future 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. For English speaking students the possibility exists to do exam in Leiden. The diploma gives allowance to work with radioactivity in the Netherlands, and most often even in Europe and America.

Target group
The course given in the Radionuclide Centre is for students who need the course for working with radioactivity during their study at the Vrije Universiteit / VUmc, and for students who are strongly interested to work with radioactivity in future.

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 or ask J.E. Handgraaf

J.E. Handgraaf is the administrator of the RNC-course, Tel: 020-4449101, JE.Handgraaf@vumc.nl.NB. 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 or gwm.visser@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

Science and Communication

Course code	AM_470587 ()
Period	Period 1
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	P. Klaassen MA
Examinator	P. Klaassen MA
Teaching staff	dr. B.J. Regeer, dr. J.F.H. Kupper, drs. ir. M.G. van der Meij, P. Klaassen MA
Teaching method(s)	Lecture, Study Group
Level	500

Course objective
- Gain theoretical insight in the relationship between science and society,
- Gain insight in the role of science communication in this relationship,
- Acquire knowledge of different theories and models of science communication,
- Acquire knowledge of different strategies, media and activities for science communication,
- Learn how to apply theoretical concepts to real-life examples,
- Development of practical skills for science communication (e.g.

writing, discussing).

Course content
Science is all around us and shapes our lives in many different ways. From the vaccines you need for travelling abroad, to the technological devices you use on a daily basis. At the same time, society shapes the development of science and technology. Science and society influence each other continuously; they communicate. Students of Science Communication are expected to become experts in understanding and designing interaction between science and society. In order for this interaction to be fruitful and valuable for both science and society, it is important to gain in-depth knowledge about the theoretical basis of the field of science communication and understand communication processes at the core of several interfaces; e.g. the communication between scientists from different disciplines, between different sciences and their stakeholders, and between science and the public. This course provides a broad basis in the field of science communication by addressing the main areas of science communication and by discussing and challenging several core concepts within this field. Students are invited to explore some issues in greater depth and active participation in lectures and workgroups is required.

Form of tuition
Lectures (22 h)
Workgroups (18 h)
Home-study for group assignments (8 h)
Home-study for individual assignments/exam (90h)

Type of assessment
Individual assignments (30%), group assignment (10%), examination (60%). For all parts a pass grade needs to be obtained.

Course reading
Academic articles. Direct links to articles will be provided on BlackBoard one month before the beginning of the course.

Target group
The course Science and Communication is a compulsory course for students of the Master specialisation Science Communication (Wetenschapscommunicatie) and is a prerequisite for the internship. Science and Communication is an optional course for students from other master programs in the health and life sciences.

Science Journalism

Course code	AM_471014 ()
Period	Period 2
Credits	6.0
Language of tuition	English
Faculty	Fac. der Aard- en Levenswetenschappen
Coordinator	dr. J.F.H. Kupper
Examinator	dr. J.F.H. Kupper
Teaching staff	dr. J.F.H. Kupper
Teaching method(s)	Lecture, Study Group, Computer lab
Level	500

Course objective
To acquire knowledge of and insight into:
- the concepts, models and issues of science journalism according to contemporary scientific literature
- the criteria for effective science journalism with respect to diverse media
- the representation of science in the media
- the role of science journalism in the use of scientific knowledge in society

To acquire skills in:
- writing popular scientific texts for different genres such as news, background and interview
- science reporting using videos
- designing science communication for different media such as newspaper, radio and internet

Orientation to the professional practice of science journalism

Course content
This course teaches the basic principles of science journalism. A series of interactive lectures reviews both the practical as well as the theoretical aspects of science journalism. Topics that are discussed are the translation of science to a language that is both compelling and understandable, the role of journalism in the interaction between science and society, images of science in the media and the ethics of science journalism. The interactive lectures invite you to take your own defendable position with regard to these issues.
Guest lectures provide insight into the professional practice of science journalists. The guest speakers work as freelancer, editor or producer at diverse science media, such as newspapers (NRC, Volkskrant), magazines (NWT), internet (Noorderlicht) and radio (Labyrint).
Finally, the course trains specific skills that you need as a science journalist, such as popular writing, popular science videos, interviewing, conceptual analysis
and program design.

Form of tuition
Lectures and seminars on theory and practice of science journalism and writing skill training (36h). Considerable time is set aside for performing science journalism in assignments (108h). The assignments are assessed by lecturers and fellow students (peer-review process). Self study (remaining hours).

Type of assessment
Several individual assignments (60%), several small group assignments (40%). All assignments must be passed (grade > 6).

Course reading
Announced on Blackboard one month before start of the course

Target group
All Master students with a Beta-Bachelor degree. Students taking this course as part of their C-specialisation within FALW or FEW will have precedence over other students. Students from other faculties and or universities need to get formal consent from the course coördinator (Frank Kupper) before enrolment.

Remarks
Course is taught in Dutch. More information: f.kupper@vu.nl.

Study of Literature

Course code	M_OLITSTU03 (311150)
Period	Ac. Year (September)
Credits	9.0
Language of tuition	English
Faculty	VUmc
Coordinator	dr. ir. V.L.J.L. Thijssen
Examinator	dr. ir. V.L.J.L. Thijssen
Level	500

The Symbolic and Cultural Meanings of Cancer

Course code	M_OSYMBOL04 (311170)
Period	Ac. Year (September)
Credits	3.0
Language of tuition	English
Faculty	VUmc
Coordinator	dr. A.K. Oderwald
Examinator	dr. A.K. Oderwald
Teaching method(s)	Seminar
Level	500

Course objective
The aim of this course is to acquire insight in the symbolic and cultural meanings of cancer.

Course content
Reading and analyzing stories of cancer patients, reading of secondary articles.

Form of tuition
The course will be given in English. The course consists of discussion groups and a symposium. Students are required to have a large self-motivation. The course will be highly interactive. An active participation is required.

Type of assessment
The course will be terminated with a paper and a presentation. More than 20% absence without agreement will have consequences for crediting the course.

Course reading
The course material consists of a reader, autobiographies of cancer patients and novels about cancer.

Target group
This course is optional for students of the Masters in Oncology. When positions are available, students of other masters can attend the course after an intake with the teacher.

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. Scheduling of this course will be dependant on the amount of students who register for the course.

Remarks
Contact: ak.oderwald@vumc.nl

Tumor Biology and Clinical Behaviour

Course code	M_OTBCB03 (311102)
Period	Period 2
Credits	6.0
Language of tuition	English
Faculty	VUmc
Coordinator	dr. E. Hooijberg
Examinator	dr. E. Hooijberg
Teaching method(s)	Lecture, Seminar
Level	400

Course objective
The aim of the course is to provide in depth knowledge of and insight in the relationship between somatic DNA alterations, gene and protein expression, and subsequent biology and clinical behavior of tumors. Students will obtain a broad overview of (development of) theories in this field of 'bench-to-bedside' translational research. Moreover, students will be trained to develop an increasingly critical view on published literature and to function as a critical peer review group towards research project plans of colleagues.

Course content
Developing novel immunotherapeutic approaches for the treatment of cancer represents a rapid growing field of research in medicine. In order to design successful strategies it is essential to understand the complex interactions between tumor cells and the immune system. The course will give the student the opportunity to enhance his or her knowledge of tumor immunology. Special focus will lie on immunological processes accompanying tumor development as well as opportunities to use the immune system to fight cancer.

Topics:
• epidemiology of tumours
• natural course and clinical behaviour of tumours
• Screening and Prevention
• Tumor – Stroma interaction
• tumour profiling and clinical outcome
• homing and metastases

• sentinel node concepts
• Molecular imaging

Form of tuition
50 hours, consisting of 32 lectures (1h each), 3 journal club discussion groups (2h each), and 3 research proposal work groups (4h each). This course is characterized by a high level of interactive education.
Students have to participate actively in discussion- and work-groups.

Type of assessment
A major aspect of the course is preparation of a research proposal by power point presentation in groups of 2 students. Tutors will help in preparing these proposals by detailed discussion sessions.The complete proposal will be presented at the end of the course.
Marks will be given by both tutors and will determine 40% of the final mark. The other 60% of the assessment will be done by a multiple-choice exam covering the major topics of the lectures.

Students have to attend all sessions during the course. Active participation is absolutely required.

Course reading
The course material consists of recent reviews in the field of gene expression, biology and clinical behaviour of tumours.

Target group
The course is compulsory for students of the Master in Oncology

Remarks
A solid basal knowledge of oncology is compulsory before the start of the course.

Coordinators:
Dr. S. Cillessen
Dr.E. Hooijberg

Tumor Immunology

Course code	M_OTUMIM10 (311179)
Period	Period 1
Credits	6.0
Language of tuition	English
Faculty	VUmc
Coordinator	prof. dr. T.D. de Gruijl
Examinator	prof. dr. T.D. de Gruijl
Teaching method(s)	Lecture, Seminar
Level	400

Course objective
•To acquire a working knowledge of various cellular mechanisms underlying antitumor immunity.
•To understand cellular interactions between the immune system and tumor cells.
•To acquire insight into the various strategies of host immune responses against tumor cells, and how tumor cells escape immune

responses.
•To understand novel immunotherapeutic strategies against cancer.
•To acquire insight in monitoring effective immune responses during immunotherapy of cancer.
•To apply the acquired knowledge and interpret scientific literature and scientific hypotheses of each of the topics described above.

Course content
Developing novel immunotherapeutic approaches for the treatment of cancer represents a rapidly growing field of research in medicine. In order to design successful strategies it is essential to understand the complex interactions between tumor cells and the immune system. The course will give the student the opportunity to enhance his or her knowledge of tumor immunology. Special focus will lie on immunological processes accompanying tumor development as well as opportunities to use the immune system to fight cancer. As this is an advanced course in the field of immunology and oncology, it will also cover in-depth discussions on molecular mechanisms underlying immune-tumor cross-talk. Students should be familiar with basic immunology and oncology, preferably via a previous basic training course in immunology and oncology.

Topics include:
- immune surveillance of cancer, tumor escape mechanisms, immunotherapeutic
- approaches (e.g. DC vaccination, monoclonal antibody therapy, adoptive T cell transfer), state-of-the–art clinical trials and monitoring immune responses in cancer patients.

Form of tuition
A written exam at the end of week 4 will consist of essay (open) questions. Active participation in presentations, discussions and Debating Clubs is part of the appraisal. A substitute assignment is required when one or more workshops have not been attended.
Final grade: combination of Open Questions(85%)and participation Debating Clubs(15%)
To succeed: a minimum of 5.5 for the written exam is required.

Type of assessment
A written exam at the end of week 4 will consist of essay (open) questions. Active participation in presentations, discussions and Debating Clubs is part of the appraisal. A substitute assignment is required when one or more workshops have not been attended.
Final grade: combination of Open Questions(85%)and participation Debating Clubs(15%)
To succeed: a minimum of 5.5 for the written exam is required.

Course reading
Chapter 15 of “The Biology of Cancer, Weinberg, Garland Science”. Furthermore, all lectures, reviews and scientific papers for workshops and scientific debates can be found on Black Board.

Target group
This course is compulsory for Master Oncology students.

Remarks
A solid basal knowledge of immunology and oncology is compulsory before start of the course.

Other students interested in the course can apply by sending an e-mail to the coordinator of the Master's Programme in Oncology

Coordinatoren:
Prof.dr. Marjolein van Egmond
Prof.dr. Tanja de Gruijl

Viral Oncogenesis

Course code	M_OVIRONC03 (311168)
Period	Period 4
Credits	3.0
Language of tuition	English
Faculty	VUmc
Coordinator	prof. dr. P.J.F. Snijders
Examinator	prof. dr. P.J.F. Snijders
Teaching method(s)	Lecture
Level	500

Course objective
The aim of the course is to give students an up-to-date insight into the mechanism of viral oncogenesis in humans.

Course content
The subjects of the course may include several of the following issues:
General aspects of DNA and RNA tumour viruses
Human papillomavirus (HPV) and cervical cancer
Hepatitis B/C viruses (HBV/HCV) and hepatocellular carcinoma
Human papillomavirus (HPV) and non-melanoma skin cancer
Epstein Barr virus (EBV) in lymphoma and carcinoma
Human Herpes Virus 8 (HHV8) and Kaposi's sarcoma

Form of tuition
6-12 contact hours. In addition the course consists of independent learning on the basis of a literature study on selected topics. Introduction session with basic lectures will be provided by the teachers. Question time with the teachers to decide in consultation.

Type of assessment
The course will be concluded by group presentations on literature studies (3 hours). Moreover, findings on literature studies should be summarized in a short written summary to be delivered at the end of the course.

Course reading
Literature consists of recent (review) papers in the field of viral oncogenesis.

Target group
This course is optional for students of the Master Course in Oncology who have completed three compulsory courses of the Master Course in Oncology.

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
After the course the students will have thorough knowledge and in depth insight into:
the fundamental processes which play a role in viral oncogenesis
the mechanisms of the various oncogenic viruses the translation of fundamental research into clinical applications Apply per email to the coordinator of the Master's Programme in Oncology.

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