This study guide contains information about the Master’s Programme in Oncology organized by VUmc School of Medical Sciences for the academic year 2017 - 2018. All information about the 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 of organisation
Within the VUmc, all educational activities are coordinated by the VUmc School of Medical Sciences. The programme director and master coordinator of the Master’s Programme in Oncology take care of the organisation and gearing of the curriculum. The master in Oncology has its own examination board and a programme committee. The programme committee advises the executive board of the VUmc, the director of the VUmc School of Medical Sciences and the programme director about the content of the Master’s Programme and the quality of execution. The examination board (EC ECRO) decrees requirements concerning admission of students, it ensures that bachelors comply with the requirements for admission, it decrees the terms concerning examination of different disciplines and it overlooks the results of examinations, internships and theses. Furthermore, the examination board evaluates the combinations of optional courses and internships of each individual student. All compulsory and optional courses are coordinated by different course coordinators. The Master’s Programme in Oncology has an Admission Board, which is responsible for the execution of the oncology entry assessment and the selection of the applicants during the admission procedure.

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

For more information please contact the programme coordinator:
Telephone: 020-44 46345
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.

VUmc School of Medical Sciences:
Ground floor G010
Van der Boechorststraat 7- 1081 BT Amsterdam
Email: studentenbalie@vumc.nl

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 board of examiners EC ECRO, if they want to attend an optional course. An approval can be asked via a digital approval form, which can be found on the faculty website of the 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 can use VUnet. If registration is not possible by using VUnet (e.g. external courses), the mode of inscription and corresponding e-mail addresses are indicated in each course description. Courses attended without the written consent of the board of examiners will not be registered. Possible financial consequences will be recovered from the student.

Minor, major internship and study of literature
The board of examiners has to give its approval for all internships and the literature study. An approval can be applied for via a digital approval form, which can be found on the faculty website. Unapproved practical training/literature study periods will not be registered by the educational secretarial office. Possible financial consequences will be recovered from the student.

**External students**

If a particular compulsory course can have more participants, students of other Master programmes from the VU can attend the course, providing that they meet the entry requirements. A written request for participation needs to be done in advance with the Oncology Admission Board including a C.V., a motivation letter, a reference letter and a recent transcript. Without permission of the Oncology Admission Board and the board of examiners of the main study programme non-Oncology students are not accepted.
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<td>Vak: Biobusiness Course (Periode 3+4)</td>
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<td>Vak: Caput Structural Biology (Ac. Jaar (september))</td>
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<tr>
<td>Vak: Clinical Immunology (Periode 2)</td>
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<td>Vak: Genomes and Gene Expression (Periode 1)</td>
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<td>Vak: Innovative Tumor Therapies (Periode 2)</td>
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<tr>
<td>Vak: Life Cell Imaging (Periode 3+4+5)</td>
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<td>Vak: Literature Study (Ac. Jaar (september))</td>
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<tr>
<td>Vak: Macroscopic, Microscopic and Pathological Anatomy of the Mouse (Periode 5)</td>
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<td>Vak: Oncogenesis (Periode 1)</td>
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<td>Vak: Protein Science (Periode 1)</td>
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<td>Vak: Proteomics in Biomedical Research (Periode 3)</td>
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<td>Vak: Radiation Protection Course, Level 5B (Ac. Jaar (september))</td>
<td>26</td>
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<tr>
<td>Vak: Science and Communication (Periode 1)</td>
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<td>Vak: Science Journalism (Periode 2)</td>
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<td>Vak: Tumor Immunology (Periode 1)</td>
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<tr>
<td>Vak: Writing Scientific English (Periode 3)</td>
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Master Oncology - Optional Courses

The optional courses are intended to deepen the knowledge acquired in the compulsory courses. These options cover both theoretical and practical aspects of Oncological and Biomedical Research. Your choice of courses will depend on your own interests and the focus of your research projects. In principle you will be given the greatest possible freedom to choose, provided that the Examination Board approves your choice. We encourage students to find optional courses outside our own faculty or institution.

Below you find the the optional courses organised by the VUmc School of Medical Sciences. Via website www.med.vu.nl you find a list of all optional courses followed by students in previous years, including courses at other faculties and institutions.

Vakken:

<table>
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Master Oncology - Compulsory Courses

The first semester of the programme consists of compulsory courses that provide you the basic knowledge about the main themes in cancer development, treatment and research. The last two courses will support you to improve your academic skills. Master Oncology students need to positively conclude at least three out of the first four compulsory courses to start their Minor Internship or Literature Study.
Opleidingsdelen:
- Academic Core Oncology

Vakken:

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<thead>
<tr>
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<td>M_OITT03</td>
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<td>Oncogenesis</td>
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Academic Core Oncology

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Master Oncology - Internships

In total, you have to spend 66 EC credit points for two internships: a minor (30 EC) and a major (36EC). 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 online forms can be found on the faculty website www.med.vu.nl. These regulations apply to all students which started their Master’s Programme in Oncology in 2016 or later.

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

All regulations regarding Internships and required forms can be found on the faculty website. These regulations apply to all students, which started the Master Oncology in 2016 or later.

Vakken:
The Literature Study will be carried out under supervision, but in this stage of the education it is expected that the student acts highly independent. It is also possible that the student proposes his/her own subject and presents an own question. The study may be focused on a scientific (bio)medical question, but a more applied or social question is also allowed. The literature objective may be related to the Major Internship. The aim of the Literature Study is that the student will be able to select, evaluate and critically discuss relevant literature.

Based on the literature analysis, the student has to clearly explain not only the state-of-the-art, but also the limitations and problems in the literature. Depending on the context of the study, the student has to formulate recommendations and strategies for further research to solve remaining problems. The Literature Study is written in the format of a review paper. It might be advised to use the concept of a systematic review.

All regulations regarding the Literature Study and required forms can be found on the faculty website. These regulations apply to all students, which started the Master Oncology in 2016 or later.

Vakken:

<table>
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Academic Core Oncology 1st year

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<td>Faculteit</td>
<td>VUmc</td>
</tr>
<tr>
<td>Coördinator</td>
<td>dr. ir. M. van Strien</td>
</tr>
<tr>
<td>Examinator</td>
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</tr>
<tr>
<td>Lesmethode(n)</td>
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<tr>
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Doel vak
The course Academic Core is created to prepare you for the transition from student to scientific researcher. The course will focus on the skills and knowledge which you are not able to learn from a textbook but need to be practiced, experiences, discussed etc. Some of the Academic Core themes will be integrated within the compulsory courses others will be emphasized during interactive workshops, network meetings, seminars etc. Topics that will be addressed are: planning your study program, presenting in English, self-reflection, sharing experiences and future
career choices with a mentor and preparing for a future job as a researcher.

**Inhoud vak**
The Academic Core spreads out over the two years of the master program and consists of the following modules
- Presenting in English
- Debating
- Ethics and legislation
- Networking
- Research orientation
- Career orientation
- Career tracking
- Mentor contact

**Onderwijsvorm**
There will be classes and interactive workshops organized during the whole master program with Academic Core themes. Part of these will be organized within other compulsory courses such as e.g. writing a research proposal or doing a debating club. Other themes will be scheduled as Academic Core classes and supported by assignments. A large part of the Academic Core will be independent learning of competences obtained during assignments and workshops.

**Toetsvorm**
The course will be concluded with a portfolio containing all the assignments and documents collected during the year. The academic core coordinator will assess if the portfolio meets the criteria at the end of the first year and the academic core will assess the whole portfolio after the second year. Only when the first and second year module of the course has been successfully assessed by the academic core examiner, the student will obtain the credits for this course.

**Doelgroep**
This course is one of the compulsory courses for the master program in Oncology and an essential part of the program.

**Intekenprocedure**
Students will be automatically registered for the first year module of the course (A). Students can register for the second year module (B) through vunet.vu.nl (under My study, register for courses and exams). The first year needs to be successfully completed to register and take part in second year activities. 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.

**Academic Core Oncology 2nd year**

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<thead>
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<tr>
<td>Examinator</td>
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</table>
Doel vak
The course Academic Core is created to prepare you for the transition from student to scientific researcher. The course will focus on the skills and knowledge which you are not able to learn from a textbook but need to be practiced, experiences, discussed etc. Some of the Academic Core themes will be integrated within the compulsory courses others will be emphasized during interactive workshops, network meetings, seminars etc. Topics that will be addressed are: planning your study program, presenting in English, self-reflection, sharing experiences and future career choices with a mentor and preparing for a future job as a researcher.

Inhoud vak
During the second year of the Academic Core, there is a CV assignment, a second mentor meeting and an exit meeting. Only when the first and second year module of the course has been successfully assessed by the master coordinator, the student will obtain the credits for this course.

Onderwijsvorm
There will be classes and interactive workshops organized during the whole master program with Academic Core themes. Part of these will be organized within other compulsory courses such as e.g. writing a research proposal or doing a debating club. Other themes will be scheduled as Academic Core classes and supported by assignments. A large part of the Academic Core will be independent learning of competences obtained during assignments and workshops.

Toetsvorm
The course will be concluded with a portfolio containing all the assignments and documents collected during the year. The master coordinator will assess if the portfolio meets the criteria at the end of each year. Only when the first and second year module of the course has been successfully assessed by the master coordinator, the student will obtain the credits for this course.

Doelgroep
This course is one of the compulsory courses for the master program in Oncology and an essential part of the program.

Intekenprocedure
Students will be automatically registered for the first year module of the course (A). Students can register for the second year module (B) through vunet.vu.nl (under My study, register for courses and exams). The first year needs to be successfully completed to register and take part in second year activities.

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

<table>
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<table>
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<tbody>
<tr>
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</table>
Doel vak
To acquire insight into:
• cellular interactions within the immune system and how molecular diversity is generated to regulate immune responses.
• the various strategies of host immune responses against pathogens, and how pathogens escape proper immune responses.
• the various strategies of the host to positively or negatively affect immune responses during cancer.
• mechanisms by which the immune system regulates either immune activation or tolerance induction.
• the mechanism of cell migration within the immune system.

End terms:
Knowledge: At the end of the course the student is familiar with current knowledge on the (molecular) pathways involved in the induction and regulation of immune responses in health and disease.
Skills:
- The student is capable of applying the acquired knowledge and can interpret scientific literature and scientific hypotheses of each of the topics described above.
- The student is able to formulate a scientific hypothesis and can design a research proposal addressing the hypothesis.
- The student is able to present and discuss the research proposal with peers.

Inhoud vak
Immunology is a rapid growing field of research in medicine and attracts a lot of attention for its contribution in various diseases such as infection diseases, cancer and auto-immunity. The course will give the student the opportunity to enhance the knowledge on the scientific aspects within the field of immunology. Special focus lies on the immunological processes underlying homeostasis control i.e., tolerance induction, immunity, antigen presentation and processes that lead to the development of inflammatory diseases (infection diseases through pathogens), auto-immunity (neuro-immunology) and cancer. Because this is an advanced course in the field of immunology, and will go into depth, particular on molecular details, students should be familiar with basic immunology preferably via a previous basic training course in immunology.

Onderwijsvorm
The course covers immunological processes at the molecular level, and consists of lectures (H: 22 hours) and study groups (W: 14 hours).

In the study groups 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
weeks include lectures, study groups, self study and preparation and
presentation of the research proposal, whereas the last part mainly
covers self study and the exam.
Contact hours with teachers and/or coordinators: 40

Toetsvorm
Study groups and active participation are compulsory. A substitution
assignment is required when one or more workshops have not been
attended, or when participation is judged as unsatisfactory.

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

Literatuur
Lectures, reviews and scientific papers are part of the material that
covers the exam (posted on Canvas).

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

Doelgroep
Students with a keen interest to study immunological processes that form
a basis for a variety of occurrences of diseases. In particular those
that cover the interaction between host-pathogen, host–tumor and
homeostatic control.
Compulsory course for MSc Biomedical Sciences student with
specialization Immunology, optional course for specialization Infectious
Diseases

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

Biobusiness Course

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

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

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

Inhoud vak
The subjects of the course will include the following:
• General aspects of how several miracle drugs have been developed (Gleevec, Herceptin, Rituxan, Avastin, anti-TNF), form early laboratory research stage to development and clinical proof-of-principle, and the economic and regulatory issues involved;
• General aspects of how certain novel diagnostic tools for staging cancers and for determining drug sensitivity have been developed (for instance for breast cancer, the mamma chip developed by Agendia);
• Impact of careful indication selection and clinical study planning in drug development;
• Regulatory issues regarding drug development, including impact of the European Clinical Trial Directive for Advanced medicinal Therapy Products;
• Examples of a number of VUmc spin-off companies and their activities in drug development and diagnostics;
• Legal and patent issues in technology transfer and partnerships between universities and pharma, biotech and devices companies.

Onderwijsvorm
There will be 24 contact hours in the form of lectures by the course coordinator and a number of invited lecturers. These will include external experts on molecular diagnostics and regulatory affairs, VUmc colleagues with presentation on their own spin-off companies, and TTO colleagues on legal and patent issues. In addition, the course consists of independent learning on the basis of exploring literature and business reports on selected topics, with the intent of preparing a final presentation and report at the end of the course by small groups.
**Toetsvorm**
The course will be concluded by group presentations on studies of scientific literature and business reports on development of certain drugs and diagnostics. These will be assigned by the course coordinator, and the literature and business studies will also be summarized in short written reports, to be delivered at the end of the course.

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

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

**Uitleg in Blackboard/Canvas**
A CANVAS course is available for this module. Students will be enrolled automatically when they register for the module via VUnet. The lecturers will post information such as presentations slides and literature links in the course.

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

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

**Biostatistics**

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<td>dr. B.I. Lissenberg-Witte</td>
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**Doel vak**
The aim of the course is to introduce several standard statistical methods and the use of the statistical software SPSS to the students.

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

Toetsvorm
Final examination will take place via a written (open book) exam (50%) and an SPSS assignment (50%). Grades of both the written exam and the SPSS assignment have to be 5.5 in order to pass the course.

Study load
7 lectures (3 hours each): 21 hours
7 SPSS practical s(4 hours): 28 hours
theoretical exam: 02 hours
SPSS assignment: 08 hours
self-study: 25 hours
-------
Total 84 hours (3 ECTS x 28 hours)

Literatuur
Course reading – advised, not compulsory

Lecture notes (i.e. PowerPoint sheets) are provided on canvas

Aanbevolen voorkennis
Some basic knowledge on (descriptive) statistics is recommended:
different types of variables [binary, categorical and continuous],
different ways to describe data [mean, standard deviation, median, inter quartile range, proportion] and to report data [frequency tables, scatterplot, histogram, boxplot].

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

Caput Epigenetics

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<td>Coördinator</td>
<td>dr. J.M. Kooter</td>
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</table>
**Doel vak**

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

**Inhoud vak**

The following topics are discussed:

- Basics of DNA methylation and Chromatin Modifications (DM & CM)
- Other types of DNA modification than 5-methyl cytosine
- Biochemistry and dynamics of DNA methylation and de-methylation
- Biochemistry of DNA histone modifications, chromatin and chromosome structure
- Role of DM & CM in gene expression and genome maintenance
- Cellular memory and chromatin modifications by the polycomb-group proteins
- Epigenetic reprogramming events during mammalian development
- Stem cells and reprogramming
- Sex-chromosome inactivation and activation
- Parental imprinting and gene dosage compensation
- Functions of non-coding RNAs in DM & CM
- Neurobiology and epigenetics
- Role of epigenetics in cancer and other diseases
- Epigenetic effects of nutrition, drugs, toxins, environmental 'factors', behaviour and stress
- Transgenerational effects: inheritance of epigenetic-based traits
- Does epigenetics play a role in evolution?
- Methods that are currently used to analyze DM & CM
Onderwijsvorm
- Self-study
- Studying recent review and research articles (ca 120 hr)
- Weblectures by experts (ca 10 hr)
- Meetings with lecturer (1-2 a week), addressing questions and problems (ca 10 hr)

Toetsvorm
Written exam of open-ended questions

Literatuur
- 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, provided via CANVAS.

Vereiste voorkennis
Bachelor level Biochemistry, Molecular Genetics and Molecular Biology

Doelgroep
Master students: Biomolecular Sciences, Biology, Biomedical Sciences and Oncology

Intekenprocedure
Email to Coordinator: j.m.kooter@vu.nl

Overige informatie
Depending on previous courses and specific interests is it possible to develop a more 'personalized' program of the course, thereby focusing on selected biological phenomena involving epigenetic mechanisms.

Lecturer:
dr. Jan M. Kooter

Caput Structural Biology

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<td>Examinator</td>
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Doel vak
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.
Inhoud vak
One of the following topics:
- Adaptation of microorganisms to extreme environments
- Prion proteins
- Fluorescent proteins

Onderwijsvorm
Self study, contact with lecturer is possible following an appointment

Toetsvorm
Oral discussion with the lecturer

Literatuur
A number of recent scientific papers will be provided

Vereiste voorkennis
See entry requirements for the specified MSc programs.

Doelgroep
MSc students "Biology", "Biomolecular Sciences" and "Biomedical Sciences"

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

Clinical Immunology

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Doel vak

- To understand immunopathogenic processes that play a role in the onset and chronicity of three immunological diseases, that cover allergy, auto-immunity and infection diseases, such as celiac disease, multiple sclerosis 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 in debating clubs where disease-related statements will be defended.
Inhoud vak
During the course, three immunological diseases will be discussed one-by-one:
celiac disease, multiple sclerosis and AIDS.

Each theme 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. During each period a certain number of 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. In turn, the students are able to apply the obtained knowledge in debating clubs, where disease-related statements have to be defended. These debating clubs are scheduled at the end of each theme.

Onderwijsvorm
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, self-study and debating clubs. Diseases are discussed one-by-one and the final part of the course mainly covers self-study and the exam.

Contact hours:
19 hours lectures
appr. 6 hours debating clubs

Toetsvorm
Both lectures and debating clubs are compulsory, and form part of the material that covers the exam. Active participation in debating clubs is part of the appraisal. Written exam at the end of week 8 includes 10 ‘assay’ questions.

Literatuur
Immunobiology by Janeway 8th edition or Parham 3rd/4th edition, including a handout which contains recent reviews specialized on the immunological diseases discussed. Next to that, self-study and literature search is required to be prepared for debating clubs.

Vereiste voorkennis
Bachelor’s course Immunology. A solid base on knowledge on immunology is compulsory before start of the study.

Doelgroep
Students with a keen interest to study immunological processes within the complexity of diseases such as allergy, multiple sclerosis and AIDS. Given the broad relevance of immunology in life sciences this course also provides excellent opportunities for other differentiations and Master programs. Compulsory course for MSc Biomedical Sciences students with specialization Immunology.

Overige informatie
Lecturers:
Dr. E.J.G. Peters, dr. B.W. van Oosten, dr. B.

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’t Hart (UMCG)

Genomes and Gene Expression

**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 expression and design experiments to study these processes.
- Apply currently-used experimental approaches and techniques to perform gene specific and genome-wide expression studies.

**Doel vak**
Course objectives:
- 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 expression and design experiments to study these processes.
- Apply currently-used experimental approaches and techniques to perform gene specific and genome-wide expression studies.

**Inhoud vak**
To achieve the course objectives, the following topics will be discussed:
Transcriptional regulation and Epigenetic mechanisms:
- Genome content and organization: coding versus non-coding sequences
- Composition and biochemistry of basic transcription machinery
- General and specific transcriptional regulators, their functions and modes of regulation
- Transcription initiation, elongation and termination
- Identification and function of regulatory sequences: promoters, enhancers, boundaries
- Properties and regulation of RNA polymerase II
- Chromatin structure and histone modifications: writers-readers-erasers concept
- The various DNA modifications, their biochemical properties, and role in gene expression
- 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
- Translation regulation and RNA degradation by micro(mi)RNAs
- RNA-editing and its biological importance
- Experimental approaches and Techniques to study post-transcriptional regulation of gene expression

Onderwijsvorm
- Interactive Lectures, including lectures by guest speakers (ca 45 hr).
- Web-lectures by experts (ca 5 hr)
- Self study (ca 100 hr)

Toetsvorm
There are 2 partial exams:
- First exam is halfway the course and consists of ~70-80 Multiple Choice question and accounts for 40% of the final mark
- Second exam is at the end of the course and consists mainly of open questions and accounts for 60% of the final mark.
For the second exam, knowledge of the first part is needed. An insufficient grade for the first can be compensated by a sufficiently high grade for the second and vice versa.
Resit of a partial-exam is not allowed. Pass with >5.5.

Literatuur
- Book: 'Gene Control' 2nd edition, by David Latchman, Garland Science
- Research and Review articles on specific topics, illustrating the latest developments in the field (from CANVAS site)
- PPT - lecture notes
**Vereiste voorkennis**
Basic concepts in Molecular Biology, Genetics, and Biochemistry

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

**Intekenprocedure**
Enrollment through studentportal: Vunet.vu.nl

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

### Innovative Tumor Therapies

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**Doel vak**
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.

**Inhoud vak**
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

**Onderwijsvorm**
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.

**Toetsvorm**
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.

**Literatuur**
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.

**Doelgroep**
This course is compulsory for Master Oncology students. External candidates are also allowed, if accepted by the program coordinator. Students from other master programs must have basic knowledge of Oncology and Immunology and will only be accepted when the number of master Oncology students is less than 40. They have to send their cv, motivation and transcript of records via email to the program coordinator. At the beginning of July 2018, students will be informed about the acceptance.

**Overige informatie**
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**

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

Literatuur
Syllabus including relevant articles.

Uitleg in Blackboard/Canvas
A CANVAS course is available for this module. Students will be enrolled automatically when they register for the module via VUnet. The lecturers will post information such as presentations slides and literature links in the course.

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

Overige informatie
Contact: r.musters@vumc.nl

Literature Study

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Macroscopic, Microscopic and Pathological Anatomy of the Mouse

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Doel vak
Animal experiments, especially using mice and rats, are an important part of many PhD projects. A better understanding of rodent anatomy, histology, pathology, genetics, wellbeing, and a proper perspective of the difference of rodent models versus human physiology can improve the quality of these experiments substantially.

Course participants are introduced into various aspects of research with rodents. The aim is to increase awareness of the physiology and genetics of experimental animals, thereby enabling better planning and execution of animal research.

After finishing this course, students:
- can describe and demonstrate the anatomy and histology of major organs of the mouse;
- are able to choose mouse strains suitable for their research;
- can interpret histological and imaging data;
- can judge behaviour and deduce wellbeing of experimental animals;
- can design mouse experiments that are better suited for translation to humans.

**Inhoud vak**
The subjects covered are:
1. Anatomy (dissection) of adult male and female mice
2. Microscopic and pathological anatomy of rodent tissues and organs
3. Dealing with pathologically changed animals
5. Imaging the mouse (MRI and PET/SPECT)
6. Gene targeting, transgenic strategies, and generation of mouse models
7. Mouse breeding and querying the Jax phenotype database
8. Rodent behaviour and experimental outcomes

**Doelgroep**
This is a PhD-students’ course organized by the OOA. OOA courses are open for Master Oncology students as optional courses under certain conditions.

**Intekenprocedure**
This course is organised and coordinated by the Tytgat Institute for Liver & Intestinal Research and the Department of Cell Biology & Histology, in collaboration with the Oncology Graduate School of Amsterdam (OOA, Onderzoekschool Oncologie Amsterdam). The course is incorporated in the course programme of the AMC Graduate School for Medical Sciences. Participants follow lectures in the morning and learn hands-on skills in the afternoon.

The course lasts 9 days and takes place once a year. Attending both weeks is recommended, however, it is possible to attend only the first week (mouse anatomy, histology, pathology, and imaging) or the second week (mouse genetics, behaviour and scaling).

Study load: 72 hours, which is comparable to 2.6 ECTS

For further information and registration contact:
Ms Mona Brox Edvardsen
Tytgat Institute for Liver and Intestinal Research
email: m.edvardsen@amc.uva.nl
**Overige informatie**
For further information contact:

Dr. J.E. Seppen  
Course coordinator  
Tytgat Institute for Liver and Intestinal Research  
email: j.seppen@amc.uva.nl

Dr. E.A.J. Reits  
Course coordinator  
Department of Cell Biology & Histology  
email: e.a.reits@amc.uva.nl

Website: www.ooa-graduateschool.org

### Major Internship

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### Minor Internship

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### Oncogenesis

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Doel vak
The aim of this course is to acquire state-of-the-art knowledge of and
deeper insights into the general concepts of oncogenesis and basic tumor
biology. These include (but are not limited to) the different genetic
alterations and classes of genes involved in tumor formation, their
role in cellular signalling, DNA repair and cell cycle control, the
(molecular) tools to study carcinogenesis including NextGen sequencing,
CRISPR-Cas9 gene editing, model systems such as transgenic mouse models
and high-throughput functional genomics.

In addition, hereditary cancer predisposition syndromes, exogenous
factors involved in oncogenesis with emphasis on viruses will be
studied. Finally, we will review markers of disease progression, genetic
counselling, screening, as well as intervention options.

Inhoud vak
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 key lectures for which students will summarize lectures
with the aid of the handouts that will become available on CANVAS. 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. Last updates on the roles of cancer genes and cancer pathways
2. Modern cancer genomics and (epi)genetics including NextGen sequencing
3. Mechanisms, models and molecular methods, including CRISPR-Cas9
genome editing
4. Viruses causing cancer
5. Clinical aspects of cancer and precancer biology
6. Cancer predisposition syndromes

Onderwijsvorm
± 45 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 56 contact hours with teachers and course
coordinators.

Toetsvorm
The course will be concluded with a 3 hours examination (24 open
questions) on the contents of the lectures. Handouts of the
presentations, including those of the literature studies, will be
available on CANVAS. There will be a rehearsal examination during
the course. Also the lecture repetitions and presentations of the
literature studies will be judged.

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.
(Review) articles posted on CANVAS and ‘the Biology of Cancer’ (Robert A. Weinberg, second edition) is recommended as a reference work for deeper background knowledge and to facilitate studying the different subjects.

Literatuur
The course reader (available on CANVAS) contains (review) articles on the various topics.

Doelgroep
This course is compulsory for Master Oncology students. External candidates are also allowed, if accepted by the program coordinator. Students from other master programs must have basic knowledge of Oncology and Immunology and will only be accepted when the number of master Oncology students is less than 40. They have to send their cv, motivation and transcript of records via email to the program coordinator. At the beginning of July 2018, students will be informed about the acceptance.

Overige informatie
The students will have acquired insight in the latest developments in the field of oncogenesis, cancer genetics and technologies to investigate the molecular aspects of cancer. Furthermore, the students will be able to integrate knowledge and insight in the formation of opinions concerning research questions about the development of cancer, and learn how to review and present scientific work.

Coordinators:
Prof. dr. R.H. Brakenhoff
Dr. R.M.F. Wolthuis

Protein Science

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Doel vak
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 properties of amino acid residues.
3. can predict the function of (parts of ) a protein based on understanding 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.

_Inhoud vak_
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..

_Onderwijsvorm_
Lectures (36 h) accompanied by work (paper) discussions (8 h) and self study (individual or in small groups) to prepare for the lectures and to discuss the material presented in lectures/accompanying papers.

_Toetsvorm_
Written exam (100%)

_Literatuur_
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.

_Doelgroep_
Masters students Biomolecular Sciences, Biomedical Sciences, Biology, Pharmaceutical Sciences and Medical Natural Sciences

_Overige informatie_
Visiting lecturer: Dr. Anil Koul, Tibotec J&J

Proteomics in Biomedical Research

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

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

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

Literatuur
Syllabus including relevant articles

Uitleg in Blackboard/Canvas
A CANVAS course is available for this module. Students will be enrolled automatically when they register for the module via VUnet. The lecturers will post information such as presentations slides and literature links in the course.

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

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

Contact:
Radiation Protection Course, Level 5B

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Doel vak
Aim of the course “Working with Radioactivity” is preparing researchers, assistants and students for safely working with radioactive substances and/or apparatus emitting ionising radiation.

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

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

Doelgroep
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.

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

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

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Doel vak

a) Gain theoretical insight in the nature of science,
b) Gain theoretical insight in the nature of communication,
c) Gain theoretical insight in the relationship between science and society,
d) Gain insight in the role of science communication in this relationship,
e) Acquire knowledge of different theories and models of science communication,
f) Acquire knowledge of different strategies, media and activities for science communication,
g) Learn how to practically apply theoretical concepts from the field of science communication in communicating science,
h) Develop practical skills for science communication (especially writing and giving oral presentations).
i) Reflect on your own knowledge and competencies pertinent to your projected (ideal) role as science communicator.

Inhoud vak

Science is all around us and shapes our lives in many different ways. From the vaccines you need to get when traveling abroad to the smartphone you use on a daily basis, and from the public transportation you use to get to the university to the ingredients of your toothpaste: scientific knowledge is elemental to all of these. Simultaneously, society shapes the ways in which science and technology develop too. Science, technology and society influence each other continuously—or, to put it differently, they ‘communicate’.

Students of the Science Communication specialization are expected to become experts in understanding and designing interactions between science and society. In order to make this interaction fruitful and...
valuable for both science and society, it is first of all important to gain theoretical knowledge about science, about communication and about science communication. Science and Communication provides students with the theoretical and conceptual foundations of the discipline of science communication. Thus, you will develop an in-depth understanding of communication processes at the core of several interfaces, including those between scientists from different disciplines, between different sciences and their stakeholders, and between science and the public.

Onderwijsvorm
Lectures (18 h)
Workgroups (15 h)
Home-study for group assignments (12 h)
Home-study for individual assignments/exam (100 h)

Toetsvorm
a) Participation. (10%)
This consists of the following:
- (small) individual assignments,
- a pitch presentation and
- a "job application".
All these are assessed as pass or fail. If you pass all of them, you have earned the first 10% of your final mark. For each one you fail, you have to do an alternative assignment.
Nota bene: if you fail your participation, this cannot be compensated with an alternative assignment!
b) A group assignment in which you develop a label to an exhibit at a science museum and write an accompanying essay. (10%)
c) A review of a science communication effort of your own choosing (an exhibit at a science center or museum, a public lecture, a (popular) science book, et cetera...). (10%)
d) "TED-talk" in which you present the research you did (e.g. for your Bsc thesis or (first) Msc internship). (20%)
e) Exam. (50%)

To pass, your grades for assignments (a), (b) and (e) have to be 6 or higher. Assignments (b), (c) and (d) are all mandatory, but grades for these individual components can be compensated by other grades.

Resit:
In case your weighed average of (a) to (e) (with sufficient grades for (a), (b) and (e)) is not sufficient, you have to take a resit. This can either consist of a second attempt at (c) or (d), or a re-exam.

Literatuur
Academic articles. Direct links to articles will be provided on Canvas.

Doelgroep
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

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Doel vak
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

Inhoud vak
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.

Onderwijsvorm
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).

Toetsvorm
Several individual assignments (60%), several small group assignments (40%). All assignments must be passed (grade > 6).
**Literatuur**
Announced on Canvas one month before start of the course

**Doelgroep**
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.

**Overige informatie**
Course is taught in Dutch. More information: f.kupper@vu.nl.

**Tumor Biology and Clinical Behaviour**

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**Doel vak**
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.

**Inhoud vak**
The course "Tumor Biology and Clinical Behavior" aims to provide in depth knowledge of and insight in the relationship of gene expression, biology and clinical behavior of tumors. Students will obtain a broad overview of development of theories in this field of oncological research. Moreover, students will be trained to develop an increasingly critical view on published literature and to function as critical mass towards research project plans of colleagues (peer review).

This course consists of three components:
1) Lectures given by experts on various topics of tumor biology and clinical behavior, comprising 'Biology of metastasis', 'Tumor profiling', 'Screening and prevention', and 'Molecular imaging'
2) Journal clubs that stimulate students to develop a critical view on published literature, using papers that span 'bench to bedside' research
3) Research proposals, in which students learn to design and present a 4-year PhD student translational research project proposal.
Lectures will be given throughout the course by the organizers and guest speakers. On the basis of their contents the lectures can be subdivided into the topics ‘Histopathology/epidemiology’, ‘Tumor profiling and biomarkers’, Bioinformatics/Biostatistics’, ‘Tumor-microenvironment interactions’, ‘Tumor cell spread / Metastasis’, ‘Molecular Imaging’ and ‘Screening and prevention’. Journal clubs will be held during the first three weeks of the course, during which one paper will be discussed in detail.

Research proposals; students will present their progress on preparation of a research proposal twice by Power Point presentations. Other students will help to improve these proposals in workgroup discussions, guided by tutors. The complete research proposal will be presented at the end of the course. The remaining time during the course can be used for preparation for Journal clubs, Research proposals, and study for examination. Details of the preparation for the Journal clubs and Research proposals are provided elsewhere in this reader.

**Onderwijsvorm**

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

**Toetsvorm**

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 an exam, consisting of assay questions, covering the major topics of the lectures.

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

**Literatuur**

The course material consists of recent reviews in the field of gene expression, biology and clinical behavior of tumors.

**Doelgroep**

This course is compulsory for Master Oncology students. External candidates are also allowed, if accepted by the program coordinator. Students from other master programs must have basic knowledge of Oncology and Immunology and will only be accepted when the number of master Oncology students is less than 40. They have to send their cv, motivation and transcript of records via email to the program coordinator. At the beginning of July 2018, students will be informed about the acceptance.

**Overige informatie**

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

Coördinators:
Dr. S.A.G.M. Cillessen
Prof.dr. E. Bloemena
Tumor Immunology

Doel vak
• 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.

Inhoud vak
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.

Onderwijsvorm
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.

Toetsvorm
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.

Literatuur
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 CANVAS.

Doelgroep
This course is compulsory for Master Oncology students. External candidates are also allowed, if accepted by the program coordinator. Students from other master programs must have basic knowledge of Oncology and Immunology and will only be accepted when the number of master Oncology students is less than 40. They have to send their cv, motivation and transcript of records via email to the program coordinator. At the beginning of July 2018, students will be informed about the acceptance.

Overige informatie
A solid basal knowledge of immunology and oncology is compulsory before start of the course. The course is only available for the Master Oncology Students.

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

Writing Scientific English

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<tr>
<th>Vakcode</th>
<th>M_FWSE09 (3120015)</th>
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<tr>
<td>Periode</td>
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<td>Coördinator</td>
<td>drs. J.K.A. Meijer</td>
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Doel vak
The aim of this course is to provide Master’s students with the essential linguistic know-how for composing a successful research proposal in English that is well organized, idiomatically and stylistically appropriate and grammatically correct.
At the end of the course students
- know how to structure a research proposal;
- know what the information elements are in parts of their research proposal;
- know how to produce clear and well-structured texts on complex subjects;
- know how to write well-structured and coherent paragraphs;
- know how to construct effective sentences;
- know what collocations are and how to use them appropriately;
- know how to adopt the right style (formal style, cohesive style, conciseness, hedging)
- know how to avoid the pitfalls of English grammar;
- know how to use punctuation marks correctly;
- know how to cite sources effectively;
- know what their own strengths and weaknesses are in writing;
- know how to give effective peer feedback.

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

Topics addressed during the course include the following:
- What makes a good proposal?
  - 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?
  - 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
  - Keeping it brief: don’t waste words
  - Writing well-structured and coherent paragraphs
  - Writing effective sentences (sophisticated word order, information distribution)
  - Using modality and boosters to your advantage
  - Using appropriate and effective vocabulary
  - Arguing convincingly
  - Using active constructions (but also using the passive effectively)
- Understanding grammar (tenses, basic word order, agreement, prepositions, etc.)
- Understanding punctuation
- Referring to sources: summarising, paraphrasing, quoting (how and when?)
- Avoiding plagiarism

Onderwijsvorm
Research proposal writing in English is an four-week course that consists of 4 contact hours a week. Students are required to spend at least 6 to 8 hours of homework per week. They will work through a phased
series of exercises that conclude with the requirement to write several
text parts (e.g. Introduction/CANVAS, Relevance section, Summary).
Feedback on the writing assignments is given by the course teacher and
by peers.

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

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

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

Uitleg in Blackboard/Canvas
A CANVAS course is available for this module. Students will be
enrolled automatically when they register for the module via VUnet. The
lecturers will post information such as presentations slides and
literature links in the course.

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

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

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

This course is only meant for Master Oncology students.

Overige informatie
- To do well, students are expected to attend all lessons. Group
  schedules are to be found on CANVAS.
- A VUnet registration for this course automatically gives access to the corresponding CANVAS site. Group registration only takes place via CANVAS (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 CANVAS, you are expected to attend all sessions (eight). If you decide to withdraw from the course, do so in time, both on CANVAS 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 CANVAS matters concerning this course, please contact by sending email to masteroncology@vumc.nl