



## Drug Discovery & Safety MSc

VU University Amsterdam - Faculteit der Exacte Wetenschappen - M Drug Discovery and Safety - 2015-2016

## Specializations

During the Master's in Drug Discovery and Safety students can specialize themselves by doing a Major in one of the following disciplines:

- Drug Discovery & Target Finding (Molecular Pharmacology)
- Drug Disposition & Safety Assessment (Molecular Toxicology)
- Drug Design & Synthesis
- Computational Medicinal Chemistry & Toxicology
- Biomarkers & Clinical Chemical Analysis

## Variants

The Master programme Drug Discovery and Safety offers four different variants for graduation:

- Research variant (O-variant)
- Society oriented variant for natural and life sciences (M-variant)
- Communication variant (C-variant)
- Education variant (E-variant)

## Global Composition of Master Programme

Variant	O	M	C	E
Compulsory courses	36-42*	30	30	30
Research project (Major) including report	42	24	24	24
Colloquium and Thesis	12	6	6	6
Practical training (company training)	-	30	30	-
M or C projects	-	18	12	-
Educational training	-	-	-	60
Optional programme	24-30*	12	18	-
Ethics and portfolio academic skills	6	-	-	-
<b>Total EC</b>	<b>120</b>	<b>120</b>	<b>120</b>	<b>120</b>

Ad \*) Depends on the specialization: Biomarkers & Clinical Analysis requires 42 EC compulsory courses with 24 EC optional programme, other specializations require 36 EC compulsory courses with 30 EC optional programme.

In order to start a minor or major research project or a company training or an internship abroad, at least 18 EC of the Master's programme should be obtained. Upon recommendation from the Master's coordinator, the examination board may also require that a specific course has been completed successfully within the mentioned 18 EC.

Students should arrange the composition of their Master's programme in consult with the Master's coordinator. The examination board formally has to approve the composition and extent of the Master's programme.

[Master co-ordinators](#)

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## Communication Variant

This specialization is intended for students with a BSc degree in any of the bèta-studies who want to specialize in communication. The programme focuses on science communication theory, research and practice. The programme of the communication (C) specialization is 1 year (60 EC). This specialization may not be combined with the Societal specialization (M) or the Education specialization (E). C-courses are shared with master students from the Faculty of Earth and Life Sciences.

### Programme

For a specialization degree it is required to spend 60 credits on Science Communication components. Two courses, one internship and a thesis are compulsory. The rest of the programme can be filled with optional courses. While science communication research is always a component of a students' internship, students have the opportunity to choose for placement at institutes such as newspapers, museums, science centers, companies, etc. to hone their practical as well as academic skills. Students' thesis comprise short (9 credits) literature studies on research questions about aspects of science communication.

To complete his or her entire Master programme (120 credits), the student has to choose 60 credits Chemistry courses.

Before formal enrolment, the students' programme has to be approved by the master coordinator as well as the programme coordinator for the Science Communication

### Programme components:

- [Recommended optional courses. 18 EC](#)
- [DDS Courses](#)
- [Compulsory Courses](#)

## Recommended optional courses. 18 EC

### Courses:

Name	Period	Credits	Code
<a href="#">Communication, Organization and Management</a>	Period 2	6.0	AM_470572
<a href="#">Science in Dialogue</a>	Period 2	6.0	AM_1002
<a href="#">Science Journalism</a>	Period 2	6.0	AM_471014
<a href="#">Science Museology</a>	Period 3	6.0	AM_470590

## DDS Courses

This specialization is intended for students with a BSc degree in any of the bèta-studies who want to specialize in communication. The programme focuses on science communication theory, research and practice. The programme of the communication (C) specialization is 1 year (60

credits). This specialization may not be combined with the Societal specialization (M) or the Education specialization (E). C-courses are shared with master students from the Faculty of Earth and Life Sciences.

To complete the entire Master programme (120 EC) of the Communication, education or social variant, the student has to choose 60 EC in DDS courses.

Programme components:

- Specialisation Courses
- Literature and Colloquium (compulsory choose 1 of 5)
- DDS Research Project (choose 1 of 5) (24 EC)
- Deficiency Courses

## Specialisation Courses

In consultation with the master coordinator and depending on the chosen specialization, 6 EC have to be chosen from the following list.

Courses:

Name	Period	Credits	Code
ADMET	Period 1	6.0	X_432721
Biomolecular Simulation in Medicinal Chemistry and Toxicology	Period 5+6	6.0	X_432664
Chemical Biology	Period 1	6.0	X_432538
Computer-Aided Drug Design and Virtual Screening	Period 2	6.0	X_432673
Drug Action	Period 3	6.0	X_432724
Drug-induced Stress and Cellular Responses	Period 2	6.0	X_432536
Mass Spectrometry	Period 2	6.0	X_435604
Physical-Organic Chemistry	Period 1	6.0	X_435663
Project Computational Design and Synthesis of Drugs	Period 4	6.0	X_432734
Signal Transduction in Health and Disease	Period 2	6.0	X_432535
Synthetic Approaches in Medicinal Chemistry	Period 2	6.0	X_435685

## Literature and Colloquium (compulsory choose 1 of 5)

Students need to select a total of 6 EC or more from the following list.

Note: Every programme, including the choice of optional courses, has to be discussed and agreed upon with the master coordinator or a personal

mentor and approved by the Examination Board.

Courses:

Name	Period	Credits	Code
Colloquium and Literature Thesis CMCT (C,E,M)	Ac. Year (September)	6.0	X_432571
Colloquium and Literature Thesis DDS BDA (C,E,M)	Ac. Year (September)	6.0	X_432570
Colloquium and Literature Thesis DDS MC, DD&S (C,E,M)	Ac. Year (September)	6.0	X_432623
Colloquium and Literature Thesis DDS MC, DDTF (C,E,M)	Ac. Year (September)	6.0	X_432624
Colloquium and Literature Thesis DDS Molecular Toxicology, DDSA (C,E,M)	Ac. Year (September)	6.0	X_432572

## DDS Research Project (choose 1 of 5) (24 EC)

Students need to select at least 30 credits or more from the following list.

Note: Every programme, including the choice of optional courses, has to be discussed and agreed upon with the master coordinator or a personal mentor and approved by the Examination Board.

Courses:

Name	Period	Credits	Code
Major Research Project DDS Biomolecular Drug Analysis (C,E,M)	Ac. Year (September)	24.0	X_432727
Major Research Project DDS Medicinal Chemistry, DD&S	Ac. Year (September)	24.0	X_432728
Major Research Project DDS Medicinal Chemistry, DDTF	Ac. Year (September)	24.0	X_432729
Major Research Project DDS Molecular Toxicology, CMCT	Ac. Year (September)	24.0	X_432730
Major Research Project DDS Molecular Toxicology, DDSA (C,E,M)	Ac. Year (September)	24.0	X_432731

## Deficiency Courses

Compulsory course for students without a Bachelor degree Pharmaceutical Sciences VU.

Niet gedefinieerd; Alle vakken starten met een recapitulatie van de benodigde voorkennis

Courses:

Name	Period	Credits	Code
<a href="#">Principles of Pharmaceutical Sciences / Pharmacology</a>	Period 1	6.0	X_435675

## Compulsory Courses

Programme components:

- [Internship communication](#)

Courses:

Name	Period	Credits	Code
<a href="#">Research methods for analyzing complex problems</a>	Period 1	6.0	AM_1182
<a href="#">Science and Communication</a>	Period 1	6.0	AM_470587

## Internship communication

Courses:

Name	Period	Credits	Code
<a href="#">Reflective Practice Internship Science Communication</a>	Ac. Year (September)	30.0	AM_1163
<a href="#">Research Internship Science Communication</a>	Ac. Year (September)	30.0	AM_1162

## Education Variant

The teaching in these variant is mainly in Dutch. Therefore we also give the requirements in Dutch.

Programma

De opleiding voor het behalen van de eerstegraads lesbevoegdheid start twee keer per jaar, in september en in februari. De opleiding wordt aangeboden in twee semesters. Uitgaande van de start in september duurt semester 1 tot en met januari en semester 2 tot juli. De opleiding is sterk praktijkgericht. De helft van de opleiding bestaat uit praktijk

door werkervaring of stage (ook wel schoolpracticum genoemd) op een school voor voortgezet onderwijs. Daarnaast kent de opleiding vier componenten: vakdidactiek, algemene didactiek/pedagogiek, praktijkonderzoek en verdiepingsmodulen.

Naast de educatievakken volgt de student 60 sp Chemistry vakken, in overleg met de mastercoördinator van de gekozen specialisatie. Hierbij zijn de twee vakken Literature thesis and Colloquium Chemistry Education Variant en Master Research Project Chemistry-Education Variant verplicht.

Studenten die bij de Communicatie variant de vakken 'interpersoonlijke communicatie' en 'museologie en buitenschoolse educatie' volgen, krijgen bij de lerarenopleiding een vrijstelling voor verdiepingsmodulen, een deel van het praktijkonderzoek en een deel van algemene didactiek.

Programme components:

- [Master Leraar VHO Scheikunde vanaf 2015](#)
- [Leraar voorbereidend hoger onderwijs in Scheikunde verplicht](#)
- [LVHO Scheikunde, overgangsregeling](#)
- [DDS Courses](#)

## Master Leraar VHO Scheikunde vanaf 2015

Courses:

Name	Period	Credits	Code
<a href="#">Didactiek 1</a>	Period 1, Period 4	6.0	O_MLDIDAC_1
<a href="#">Didactiek 2</a>	Period 2+3, Period 5+6	6.0	O_MLDIDAC_2
<a href="#">Didactiek 3</a>	Period 4+5+6	9.0	O_MLDIDAC_3
<a href="#">Peergroup 1</a>	Period 1+2+3, Period 4+5+6	0.0	O_MLPEERGR_1
<a href="#">Peergroup 2</a>	Period 3+4+5	0.0	O_MLPEERGR_2
<a href="#">Praktijk 1</a>	Period 1, Period 4	6.0	O_MLPRAK_1
<a href="#">Praktijk 2</a>	Period 2+3, Period 5+6	9.0	O_MLPRAK_2
<a href="#">Praktijk 3</a>	Period 4+5+6	15.0	O_MLPRAK_3
<a href="#">Praktijk onderzoek 1</a>	Period 3, Period 6	3.0	O_MLPROZ_1
<a href="#">Praktijk onderzoek 2</a>	Period 4+5+6	6.0	O_MLPROZ_2

## Leraar voorbereidend hoger onderwijs in Scheikunde verplicht

Courses:

Name	Period	Credits	Code
<a href="#">Educational and Pedagogical Studies II</a>	Period 1+2	3.0	O_MLADEPII
<a href="#">Research II</a>	Period 1+2+3	6.0	O_MLVPOOII
<a href="#">Specialisation</a>	Period 2+3	3.0	O_MLVERD

<a href="#">Teaching Methodology Chemistry II</a>	Period 1+2	6.0	O_MLVDSKII
<a href="#">Teaching Practice II</a>	Period 1+2+3	15.0	O_MLPRAKII

## LVHO Scheikunde, overgangsregeling

Courses:

Name	Period	Credits	Code
<a href="#">Educational and Pedagogical Studies I</a>	Period 1+2	6.0	O_MLADEPI
<a href="#">Research I</a>	Period 1+2+3	3.0	O_MLVPOOI
<a href="#">Teaching Methodology Chemistry I</a>	Period 1+2	3.0	O_MLVDSKI
<a href="#">Teaching Practice I</a>	Period 1+2+3	15.0	O_MLPRAKI

## DDS Courses

This specialization is intended for students with a BSc degree in any of the bèta-studies who want to specialize in communication. The programme focuses on science communication theory, research and practice. The programme of the communication (C) specialization is 1 year (60 credits). This specialization may not be combined with the Societal specialization (M) or the Education specialization (E). C-courses are shared with master students from the Faculty of Earth and Life Sciences.

To complete the entire Master programme (120 EC) of the Communication, education or social variant, the student has to choose 60 EC in DDS courses.

Programme components:

- [Specialisation Courses](#)
- [Literature and Colloquium \(compulsory choose 1 of 5\)](#)
- [DDS Research Project \(choose 1 of 5\) \(24 EC\)](#)
- [Deficiency Courses](#)

## Specialisation Courses

In consultation with the master coordinator and depending on the chosen specialization, 6 EC have to be chosen from the following list.

Courses:

Name	Period	Credits	Code
<a href="#">ADMET</a>	Period 1	6.0	X_432721
<a href="#">Biomolecular Simulation in Medicinal Chemistry and Toxicology</a>	Period 5+6	6.0	X_432664

Chemical Biology	Period 1	6.0	X_432538
Computer-Aided Drug Design and Virtual Screening	Period 2	6.0	X_432673
Drug Action	Period 3	6.0	X_432724
Drug-induced Stress and Cellular Responses	Period 2	6.0	X_432536
Mass Spectrometry	Period 2	6.0	X_435604
Physical-Organic Chemistry	Period 1	6.0	X_435663
Project Computational Design and Synthesis of Drugs	Period 4	6.0	X_432734
Signal Transduction in Health and Disease	Period 2	6.0	X_432535
Synthetic Approaches in Medicinal Chemistry	Period 2	6.0	X_435685

## Literature and Colloquium (compulsory choose 1 of 5)

Students need to select a total of 6 EC or more from the following list.

Note: Every programme, including the choice of optional courses, has to be discussed and agreed upon with the master coordinator or a personal mentor and approved by the Examination Board.

Courses:

Name	Period	Credits	Code
Colloquium and Literature Thesis CMCT (C,E,M)	Ac. Year (September)	6.0	X_432571
Colloquium and Literature Thesis DDS BDA (C,E,M)	Ac. Year (September)	6.0	X_432570
Colloquium and Literature Thesis DDS MC, DD&S (C,E,M)	Ac. Year (September)	6.0	X_432623
Colloquium and Literature Thesis DDS MC, DDTF (C,E,M)	Ac. Year (September)	6.0	X_432624
Colloquium and Literature Thesis DDS Molecular Toxicology, DDSA (C,E,M)	Ac. Year (September)	6.0	X_432572

## DDS Research Project (choose 1 of 5) (24 EC)

Students need to select at least 30 credits or more from the following list.

Note: Every programme, including the choice of optional courses, has to be discussed and agreed upon with the master coordinator or a personal mentor and approved by the Examination Board.

Courses:

Name	Period	Credits	Code
Major Research Project DDS Biomolecular Drug Analysis (C,E,M)	Ac. Year (September)	24.0	X_432727
Major Research Project DDS Medicinal Chemistry, DD&S	Ac. Year (September)	24.0	X_432728
Major Research Project DDS Medicinal Chemistry, DDTF	Ac. Year (September)	24.0	X_432729
Major Research Project DDS Molecular Toxicology, CMCT	Ac. Year (September)	24.0	X_432730
Major Research Project DDS Molecular Toxicology, DDSA (C,E,M)	Ac. Year (September)	24.0	X_432731

## Deficiency Courses

Compulsory course for students without a Bachelor degree Pharmaceutical Sciences VU.

Niet gedefinieerd; Alle vakken starten met een recapitulatie van de benodigde voorkennis

Courses:

Name	Period	Credits	Code
Principles of Pharmaceutical Sciences / Pharmacology	Period 1	6.0	X_435675

## Research Variant DDTF

The programme consists of 120 EC

- compulsory courses 36 credits (including a Literature Thesis and Colloquium 12 EC)
- compulsory choice Ethics and Portfolio Academic Skills 6 EC
- compulsory choices Major Research Project at least 42 EC
- optional courses to complete 120 EC.

Note: Every programme, including the choice of optional courses, has to be discussed and agreed upon with the master coordinator or a personal mentor and approved by the Examination Board.

Master Coordinator:

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Programme components:

- Ethics and Academic Skills
- Deficiency Courses
- Research Project (Choose 42, 48, 54 or 60 EC)
- Recommended optional courses
- Compulsory courses
- Compulsory courses research master DDS

## Ethics and Academic Skills

In consultation with the master coordinator and depending on the chosen specialization, 6 EC have to be chosen from the following list.

Courses:

Name	Period	Credits	Code
Business Management in Health and Life Sciences	Period 2	6.0	AM_470584
Clinical Development and Clinical Trials	Period 3	3.0	AM_1180
Communication, Organization and Management	Period 2	6.0	AM_470572
Entrepreneurship in Health and Life Sc.	Period 2	6.0	AM_470575
Epidemiology	Period 3	3.0	AM_1179
Ethics and Academic skills	Ac. Year (September)	1.0	X_432725
Ethics and Academic skills	Ac. Year (September)	2.0	X_432726
Ethics and Academic Skills	Ac. Year (September)	6.0	X_437556
Ethics and Academic Skills	Ac. Year (September)	3.0	X_432517
Ethics in Life Sciences	Period 3	3.0	AM_470707
Managing Science and Technology in Society	Period 1	6.0	AM_470586
Research methods for analyzing complex problems	Period 1	6.0	AM_1182
Science and Communication	Period 1	6.0	AM_470587
Science in Dialogue	Period 2	6.0	AM_1002
Science Journalism	Period 2	6.0	AM_471014
Scientific Writing in English	Period 2, Period 6	3.0	X_400592
Teaching Assistant	Ac. Year (September)	3.0	X_432741
Teaching Assistant	Ac. Year (September)	6.0	X_432742
Tutoring Students	Period 2	3.0	X_432625

## Deficiency Courses

Compulsory course for students without a Bachelor degree Pharmaceutical Sciences VU.

Niet gedefinieerd; Alle vakken starten met een recapitulatie van de benodigde voorkennis

Courses:

Name	Period	Credits	Code
<a href="#">Principles of Pharmaceutical Sciences / Pharmacology</a>	Period 1	6.0	X_435675

## Research Project (Choose 42, 48, 54 or 60 EC)

Compulsory choice of at least 42 credits.

Note: Every programme, including the choice of optional courses, has to be discussed and agreed upon with the master coordinator or a personal mentor and approved by the Examination Board.

Courses:

Name	Period	Credits	Code
<a href="#">Major Research Project Med. Chem., Drug Disc. &amp; Target Find.</a>	Ac. Year (September)	48.0	X_432550
<a href="#">Major Research Project Med. Chem., Drug Disc. &amp; Target Find.</a>	Ac. Year (September)	54.0	X_432551
<a href="#">Major Research Project Med. Chem., Drug Disc. &amp; Target Find.</a>	Ac. Year (September)	60.0	X_432552
<a href="#">Major Research Project Med. Chem., Drug Disc. &amp; Target Find.</a>	Ac. Year (September)	42.0	X_432547

## Recommended optional courses

The subject options of 30, 24, 18 or 12 EC can be completed with the possibilities below.

Note: Every programme, including the choice of optional courses, has to be discussed and agreed upon with the master coordinator or a personal mentor and approved by the Examination Board.

Courses:

Name	Period	Credits	Code
Advanced Course on Drug Disp. & Safety Assessment (Mol.Tox.)	Period 5+6	6.0	X_435681
Applied Theoretical Chemistry	Ac. Year (September)	12.0	X_432501
Applied Theoretical Chemistry	Period 4	6.0	X_435612
Biomolecular Simulation in Medicinal Chemistry and Toxicology	Period 5+6	6.0	X_432664
Company Training Drug Discovery & Target Finding	Ac. Year (September)	18.0	X_432621
Company Training Drug Discovery & Target Finding	Ac. Year (September)	24.0	X_432747
Company Training Drug Discovery & Target Finding	Ac. Year (September)	30.0	X_432752
Company Training Drug Discovery & Target Finding	Ac. Year (September)	36.0	X_432836
Computer-Aided Drug Design and Virtual Screening	Period 2	6.0	X_432673
Drug-induced Stress and Cellular Responses	Period 2	6.0	X_432536
Internship abroad DDS Drug Disc. & Target Find.	Ac. Year (September)	18.0	X_432678
Internship abroad DDS Drug Disc. & Target Find.	Ac. Year (September)	24.0	X_432757
Internship abroad DDS Drug Disc. & Target Find.	Ac. Year (September)	30.0	X_432762
Internship abroad DDS Drug Disc. & Target Find.	Ac. Year (September)	36.0	X_432840
Mass Spectrometry	Period 2	6.0	X_435604
Minor Research Project Biomol. Drug Analysis	Ac. Year (September)	24.0	X_432658
Minor Research Project Biomol. Drug Analysis	Ac. Year (September)	30.0	X_432704
Minor Research Project Biomolecular Drug Analysis	Ac. Year (September)	18.0	X_432689
Minor Research Project DDS Medicinal Chemistry, DD&S	Ac. Year (September)	18.0	X_432692
Minor Research Project DDS Medicinal Chemistry, DD&S	Ac. Year (September)	24.0	X_432693
Minor Research Project DDS Medicinal Chemistry, DD&S	Ac. Year (September)	30.0	X_432705
Minor Research Project DDS Molecular Toxicology, CMCT	Ac. Year (September)	24.0	X_432632

Minor Research Project DDS Molecular Toxicology, DDSA	Ac. Year (September)	24.0	X_432591
Minor Research Project DDS Molecular Toxicology, DDSA	Ac. Year (September)	30.0	X_432592
Minor Research Project DDS Molecular Toxicology, DDSA	Ac. Year (September)	18.0	X_432620
Minor Research Project DDS, CMCT	Ac. Year (September)	18.0	X_432507
Minor Research Project DDS, CMCT	Ac. Year (September)	30.0	X_432707
Minor Research Project Med. Chem., Drug Disc. & Target Find.	Ac. Year (September)	18.0	X_432696
Minor Research Project Med. Chem., Drug Disc. & Target Find.	Ac. Year (September)	30.0	X_432706
Minor Research Project Med. Chem., Drug Disc. & Target Find.	Ac. Year (September)	24.0	X_432635
Protein Analysis	Period 5	6.0	X_435045
Supramolecular Chemistry and Nanomaterials	Period 1	6.0	X_435653

## Compulsory courses

Courses:

Name	Period	Credits	Code
Colloquium and Literature Thesis DDS MC, DDTF	Ac. Year (September)	12.0	X_432574
High-Throughput Screening	Period 2	6.0	X_435047
Signal Transduction in Health and Disease	Period 2	6.0	X_432535

## Compulsory courses research master DDS

Courses:

Name	Period	Credits	Code
ADMET	Period 1	6.0	X_432721
Chemical Biology	Period 1	6.0	X_432538
Drug Action	Period 3	6.0	X_432724

Project Computational Design and Synthesis of Drugs	Period 4	6.0	X_432734
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## Research Variant DDSA

The programme consists of 120 EC

- compulsory courses 30 EC (including a Literature Thesis and Colloquium 12 EC)
- compulsory choice Ethics and Portfolio Academic Skills 6 EC
- compulsory choices Major Research Project at least 42 EC
- optional courses to complete 120 EC.

Note: Every programme, including the choice of optional courses, has to be discussed and agreed upon with the master coordinator or a personal mentor and approved by the Examination Board.

Master Coordinator:

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Programme components:

- [Ethics and Academic Skills](#)
- [Deficiency Courses](#)
- [Research Project \(Choose 42, 48, 54 or 60 EC\)](#)
- [Recommended optional courses](#)
- [Compulsory Courses](#)
- [Compulsory courses research master DDS](#)

## Ethics and Academic Skills

In consultation with the master coordinator and depending on the chosen specialization, 6 EC have to be chosen from the following list.

Courses:

Name	Period	Credits	Code
<a href="#">Business Management in Health and Life Sciences</a>	Period 2	6.0	AM_470584
<a href="#">Clinical Development and Clinical Trials</a>	Period 3	3.0	AM_1180
<a href="#">Communication, Organization and Management</a>	Period 2	6.0	AM_470572
<a href="#">Entrepreneurship in Health and Life Sc.</a>	Period 2	6.0	AM_470575
<a href="#">Epidemiology</a>	Period 3	3.0	AM_1179
<a href="#">Ethics and Academic skills</a>	Ac. Year (September)	1.0	X_432725

<a href="#">Ethics and Academic skills</a>	Ac. Year (September)	2.0	X_432726
<a href="#">Ethics and Academic Skills</a>	Ac. Year (September)	6.0	X_437556
<a href="#">Ethics and Academic Skills</a>	Ac. Year (September)	3.0	X_432517
<a href="#">Ethics in Life Sciences</a>	Period 3	3.0	AM_470707
<a href="#">Managing Science and Technology in Society</a>	Period 1	6.0	AM_470586
<a href="#">Research methods for analyzing complex problems</a>	Period 1	6.0	AM_1182
<a href="#">Science and Communication</a>	Period 1	6.0	AM_470587
<a href="#">Science in Dialogue</a>	Period 2	6.0	AM_1002
<a href="#">Science Journalism</a>	Period 2	6.0	AM_471014
<a href="#">Scientific Writing in English</a>	Period 2, Period 6	3.0	X_400592
<a href="#">Teaching Assistant</a>	Ac. Year (September)	3.0	X_432741
<a href="#">Teaching Assistant</a>	Ac. Year (September)	6.0	X_432742
<a href="#">Tutoring Students</a>	Period 2	3.0	X_432625

## Deficiency Courses

Compulsory course for students without a Bachelor degree Pharmaceutical Sciences VU.

Niet gedefinieerd; Alle vakken starten met een recapitulatie van de benodigde voorkennis

Courses:

Name	Period	Credits	Code
<a href="#">Principles of Pharmaceutical Sciences / Pharmacology</a>	Period 1	6.0	X_435675

## Research Project (Choose 42, 48, 54 or 60 EC)

Compulsory choice of at least 42 EC.

Note: Every programme, including the choice of optional courses, has to be discussed and agreed upon with the master coordinator or a personal mentor and approved by the Examination Board.

Courses:

Name	Period	Credits	Code
<a href="#">Major Research Project DDS Molecular Toxicology, DDSA</a>	Ac. Year (September)	42.0	X_432559
<a href="#">Major Research Project DDS Molecular Toxicology, DDSA</a>	Ac. Year (September)	48.0	X_432561

Major Research Project DDS Molecular Toxicology, DDSA	Ac. Year (September)	54.0	X_432562
Major Research Project DDS Molecular Toxicology, DDSA	Ac. Year (September)	60.0	X_432563

## Recommended optional courses

The subject options of 36, 30, 24, or 18 EC can be completed with the possibilities below.

Note: Every programme, including the choice of optional courses, has to be discussed and agreed upon with the master coordinator or a personal mentor and approved by the Examination Board.

Courses:

Name	Period	Credits	Code
Applied Theoretical Chemistry	Ac. Year (September)	12.0	X_432501
Applied Theoretical Chemistry	Period 4	6.0	X_435612
Biomolecular Simulation in Medicinal Chemistry and Toxicology	Period 5+6	6.0	X_432664
Company Training DDS Drug, Disp. and Saf. Assessm.	Ac. Year (September)	18.0	X_432672
Company Training DDS Drug, Disp. and Saf. Assessm.	Ac. Year (September)	24.0	X_432746
Company Training DDS Drug, Disp. and Saf. Assessm.	Ac. Year (September)	30.0	X_432751
Company Training DDS Drug, Disp. and Saf. Assessm.	Ac. Year (September)	36.0	X_432834
Computer-Aided Drug Design and Virtual Screening	Period 2	6.0	X_432673
Internship abroad DDS Drug, Disp. and Saf. Assessm.	Ac. Year (September)	18.0	X_432677
Internship abroad DDS Drug, Disp. and Saf. Assessm.	Ac. Year (September)	24.0	X_432756
Internship abroad DDS Drug, Disp. and Saf. Assessm.	Ac. Year (September)	30.0	X_432761

Internship abroad DDS Drug, Disp. and Saf. Assessm.	Ac. Year (September)	36.0	X_432841
Minor Research Project Biomol. Drug Analysis	Ac. Year (September)	24.0	X_432658
Minor Research Project Biomol. Drug Analysis	Ac. Year (September)	30.0	X_432704
Minor Research Project Biomolecular Drug Analysis	Ac. Year (September)	18.0	X_432689
Minor Research Project DDS Medicinal Chemistry, DD&S	Ac. Year (September)	18.0	X_432692
Minor Research Project DDS Medicinal Chemistry, DD&S	Ac. Year (September)	24.0	X_432693
Minor Research Project DDS Medicinal Chemistry, DD&S	Ac. Year (September)	30.0	X_432705
Minor Research Project DDS Molecular Toxicology, CMCT	Ac. Year (September)	24.0	X_432632
Minor Research Project DDS Molecular Toxicology, DDSA	Ac. Year (September)	24.0	X_432591
Minor Research Project DDS Molecular Toxicology, DDSA	Ac. Year (September)	30.0	X_432592
Minor Research Project DDS Molecular Toxicology, DDSA	Ac. Year (September)	18.0	X_432620
Minor Research Project DDS, CMCT	Ac. Year (September)	18.0	X_432507
Minor Research Project DDS, CMCT	Ac. Year (September)	30.0	X_432707
Minor Research Project Med. Chem., Drug Disc. & Target Find.	Ac. Year (September)	18.0	X_432696
Minor Research Project Med. Chem., Drug Disc. & Target Find.	Ac. Year (September)	30.0	X_432706
Minor Research Project Med. Chem., Drug Disc. & Target.Find.	Ac. Year (September)	24.0	X_432635
Signal Transduction in Health and Disease	Period 2	6.0	X_432535
Supramolecular Chemistry and Nanomaterials	Period 1	6.0	X_435653

## Compulsory Courses



Courses:

Name	Period	Credits	Code
<a href="#">Advanced Course on Drug Disp. &amp; Safety Assessment (Mol.Tox.)</a>	Period 5+6	6.0	X_435681
<a href="#">Drug-induced Stress and Cellular Responses</a>	Period 2	6.0	X_432536
<a href="#">Literature thesis and Colloquium DDS Molecular Toxicology, DDSA</a>	Ac. Year (September)	12.0	X_432575

## Compulsory courses research master DDS

Courses:

Name	Period	Credits	Code
<a href="#">ADMET</a>	Period 1	6.0	X_432721
<a href="#">Chemical Biology</a>	Period 1	6.0	X_432538
<a href="#">Drug Action</a>	Period 3	6.0	X_432724
<a href="#">Project Computational Design and Synthesis of Drugs</a>	Period 4	6.0	X_432734

## Research variant CMCT

The programme consists of 120 EC

- compulsory courses 36 EC (including a Literature Thesis and Colloquium 12 EC)
- compulsory choice Ethics and Portfolio Academic Skills 6 EC
- compulsory choices Major Research Project at least 42 EC
- optional courses to complete 120 EC.

Note: Every programme, including the choice of optional courses, has to be discussed and agreed upon with the master coordinator or a personal mentor and approved by the Examination Board.

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Programme components:

- [Ethics and Academic Skills](#)
- [Deficiency Courses](#)
- [Research Project \(Choose 42, 48, 54 or 60 EC\)](#)
- [Recommended optional choice](#)

- Compulsory Courses
- Compulsory courses research master DDS

## Ethics and Academic Skills

In consultation with the master coordinator and depending on the chosen specialization, 6 EC have to be chosen from the following list.

Courses:

Name	Period	Credits	Code
Business Management in Health and Life Sciences	Period 2	6.0	AM_470584
Clinical Development and Clinical Trials	Period 3	3.0	AM_1180
Communication, Organization and Management	Period 2	6.0	AM_470572
Entrepreneurship in Health and Life Sc.	Period 2	6.0	AM_470575
Epidemiology	Period 3	3.0	AM_1179
Ethics and Academic skills	Ac. Year (September)	1.0	X_432725
Ethics and Academic skills	Ac. Year (September)	2.0	X_432726
Ethics and Academic Skills	Ac. Year (September)	6.0	X_437556
Ethics and Academic Skills	Ac. Year (September)	3.0	X_432517
Ethics in Life Sciences	Period 3	3.0	AM_470707
Managing Science and Technology in Society	Period 1	6.0	AM_470586
Research methods for analyzing complex problems	Period 1	6.0	AM_1182
Science and Communication	Period 1	6.0	AM_470587
Science in Dialogue	Period 2	6.0	AM_1002
Science Journalism	Period 2	6.0	AM_471014
Scientific Writing in English	Period 2, Period 6	3.0	X_400592
Teaching Assistant	Ac. Year (September)	3.0	X_432741
Teaching Assistant	Ac. Year (September)	6.0	X_432742
Tutoring Students	Period 2	3.0	X_432625

## Deficiency Courses

Compulsory course for students without a Bachelor degree Pharmaceutical Sciences VU.

Niet gedefinieerd; Alle vakken starten met een recapitulatie van de benodigde voorkennis

Courses:

Name	Period	Credits	Code
<a href="#">Principles of Pharmaceutical Sciences / Pharmacology</a>	Period 1	6.0	X_435675

## Research Project (Choose 42, 48, 54 or 60 EC)

Compulsory choice of at least 42 credits.

Note: Every programme, including the choice of optional courses, has to be discussed and agreed upon with the master coordinator or a personal mentor and approved by the Examination Board.

Courses:

Name	Period	Credits	Code
<a href="#">Major Research Project Mol. Tox., Comp. Med. Chem. &amp; Tox.</a>	Ac. Year (September)	42.0	X_432553
<a href="#">Major Research Project Mol. Tox., Comp. Med. Chem. &amp; Tox.</a>	Ac. Year (September)	48.0	X_432556
<a href="#">Major Research Project Mol. Tox., Comp. Med. Chem. &amp; Tox.</a>	Ac. Year (September)	54.0	X_432557
<a href="#">Major Research Project Mol. Tox., Comp. Med. Chem. &amp; Tox.</a>	Ac. Year (September)	60.0	X_432558

## Recommended optional choice

The subject options of 30, 24, 18 or 12 EC can be completed with the possibilities below.

Note: Every programme, including the choice of optional courses, has to be discussed and agreed upon with the master coordinator or a personal mentor and approved by the Examination Board.

Courses:

Name	Period	Credits	Code
<a href="#">Applied Theoretical Chemistry</a>	Ac. Year (September)	12.0	X_432501
<a href="#">Applied Theoretical Chemistry</a>	Period 4	6.0	X_435612
<a href="#">Company Training Comp. Med. Chem. &amp; Tox.</a>	Ac. Year (September)	18.0	X_432619

Company Training Comp. Med. Chem. & Tox.	Ac. Year (September)	24.0	X_432744
Company Training Comp. Med. Chem. & Tox.	Ac. Year (September)	30.0	X_432749
Company Training Comp. Med. Chem. & Tox.	Ac. Year (September)	36.0	X_432835
Density Functional Theory for Chemists	Ac. Year (September)	6.0	X_435111
Density Functional Theory for Chemists	Ac. Year (September)	12.0	X_435112
Drug-induced Stress and Cellular Responses	Period 2	6.0	X_432536
Internship abroad DDS Comp. Med. Chem. & Tox.	Ac. Year (September)	18.0	X_432675
Internship abroad DDS Comp. Med. Chem. & Tox.	Ac. Year (September)	24.0	X_432754
Internship abroad DDS Comp. Med. Chem. & Tox.	Ac. Year (September)	30.0	X_432759
Internship abroad DDS Comp. Med. Chem. & Tox.	Ac. Year (September)	36.0	X_432838
Minor Research Project Biomol. Drug Analysis	Ac. Year (September)	24.0	X_432658
Minor Research Project Biomol. Drug Analysis	Ac. Year (September)	30.0	X_432704
Minor Research Project Biomolecular Drug Analysis	Ac. Year (September)	18.0	X_432689
Minor Research Project DDS Medicinal Chemistry, DD&S	Ac. Year (September)	18.0	X_432692
Minor Research Project DDS Medicinal Chemistry, DD&S	Ac. Year (September)	24.0	X_432693
Minor Research Project DDS Medicinal Chemistry, DD&S	Ac. Year (September)	30.0	X_432705
Minor Research Project DDS Molecular Toxicology, CMCT	Ac. Year (September)	24.0	X_432632
Minor Research Project DDS Molecular Toxicology, DDSA	Ac. Year (September)	24.0	X_432591
Minor Research Project DDS Molecular Toxicology, DDSA	Ac. Year (September)	30.0	X_432592
Minor Research Project DDS Molecular Toxicology, DDSA	Ac. Year (September)	18.0	X_432620
Minor Research Project DDS, CMCT	Ac. Year (September)	18.0	X_432507
Minor Research Project DDS, CMCT	Ac. Year (September)	30.0	X_432707

Minor Research Project Med. Chem., Drug Disc. & Target Find.	Ac. Year (September)	18.0	X_432696
Minor Research Project Med. Chem., Drug Disc. & Target Find.	Ac. Year (September)	30.0	X_432706
Minor Research Project Med. Chem., Drug Disc. & Target.Find.	Ac. Year (September)	24.0	X_432635
Signal Transduction in Health and Disease	Period 2	6.0	X_432535
Supramolecular Chemistry and Nanomaterials	Period 1	6.0	X_435653

## Compulsory Courses

Courses:

Name	Period	Credits	Code
Biomolecular Simulation in Medicinal Chemistry and Toxicology	Period 5+6	6.0	X_432664
Colloquium and Literature Thesis DDS MC, CMCT	Ac. Year (September)	12.0	X_432576
Computer-Aided Drug Design and Virtual Screening	Period 2	6.0	X_432673

## Compulsory courses research master DDS

Courses:

Name	Period	Credits	Code
ADMET	Period 1	6.0	X_432721
Chemical Biology	Period 1	6.0	X_432538
Drug Action	Period 3	6.0	X_432724
Project Computational Design and Synthesis of Drugs	Period 4	6.0	X_432734

## Research variant DD&S

The programme consists of 120 EC

- compulsory courses 36 EC (including a Literature Thesis and Colloquium 12 EC)
- compulsory choice Ethics and Portfolio Academic Skills 6 EC
- compulsory choices Major Research Project at least 42 EC
- optional courses to complete 120 EC.

Note: Every programme, including the choice of optional courses, has to be discussed and agreed upon with the master coordinator or a personal mentor and approved by the Examination Board.

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Programme components:

- [Ethics and Academic Skills](#)
- [Deficiency Courses](#)
- [Research Project \(Choose 42, 48, 54 or 60 EC\)](#)
- [Recommended optional choice](#)
- [Compulsory Courses](#)
- [Compulsory courses research master DDS](#)

## Ethics and Academic Skills

In consultation with the master coordinator and depending on the chosen specialization, 6 EC have to be chosen from the following list.

Courses:

Name	Period	Credits	Code
<a href="#">Business Management in Health and Life Sciences</a>	Period 2	6.0	AM_470584
<a href="#">Clinical Development and Clinical Trials</a>	Period 3	3.0	AM_1180
<a href="#">Communication, Organization and Management</a>	Period 2	6.0	AM_470572
<a href="#">Entrepreneurship in Health and Life Sc.</a>	Period 2	6.0	AM_470575
<a href="#">Epidemiology</a>	Period 3	3.0	AM_1179
<a href="#">Ethics and Academic skills</a>	Ac. Year (September)	1.0	X_432725
<a href="#">Ethics and Academic skills</a>	Ac. Year (September)	2.0	X_432726
<a href="#">Ethics and Academic Skills</a>	Ac. Year (September)	6.0	X_437556
<a href="#">Ethics and Academic Skills</a>	Ac. Year (September)	3.0	X_432517
<a href="#">Ethics in Life Sciences</a>	Period 3	3.0	AM_470707
<a href="#">Managing Science and Technology in Society</a>	Period 1	6.0	AM_470586
<a href="#">Research methods for analyzing complex problems</a>	Period 1	6.0	AM_1182
<a href="#">Science and Communication</a>	Period 1	6.0	AM_470587
<a href="#">Science in Dialogue</a>	Period 2	6.0	AM_1002

Science Journalism	Period 2	6.0	AM_471014
Scientific Writing in English	Period 2, Period 6	3.0	X_400592
Teaching Assistant	Ac. Year (September)	3.0	X_432741
Teaching Assistant	Ac. Year (September)	6.0	X_432742
Tutoring Students	Period 2	3.0	X_432625

## Deficiency Courses

Compulsory course for students without a Bachelor degree Pharmaceutical Sciences VU.

Niet gedefinieerd; Alle vakken starten met een recapitulatie van de benodigde voorkennis

Courses:

Name	Period	Credits	Code
Principles of Pharmaceutical Sciences / Pharmacology	Period 1	6.0	X_435675

## Research Project (Choose 42, 48, 54 or 60 EC)

Compulsory choice of at least 42 EC.

Note: Every programme, including the choice of optional courses, has to be discussed and agreed upon with the master coordinator or a personal mentor and approved by the Examination Board.

Courses:

Name	Period	Credits	Code
Major Research Project DDS Medicinal Chemistry, DD&S	Ac. Year (September)	42.0	X_432509
Major Research Project DDS Medicinal Chemistry, DD&S	Ac. Year (September)	48.0	X_432544
Major Research Project DDS Medicinal Chemistry, DD&S	Ac. Year (September)	54.0	X_432545
Major Research Project DDS Medicinal Chemistry, DD&S	Ac. Year (September)	60.0	X_432546

## Recommended optional choice

The subject options of 30, 24, 18 or 12 EC can be completed with the possibilities below.

Note: Every programme, including the choice of optional courses, has to be discussed and agreed upon with the master coordinator or a personal mentor and approved by the Examination Board.

Courses:

<b>Name</b>	<b>Period</b>	<b>Credits</b>	<b>Code</b>
Biomolecular Simulation in Medicinal Chemistry and Toxicology	Period 5+6	6.0	X_432664
Company Training DDS Drug Design & Synth.	Ac. Year (September)	18.0	X_432671
Company Training DDS Drug Design & Synth.	Ac. Year (September)	24.0	X_432745
Company Training DDS Drug Design & Synth.	Ac. Year (September)	30.0	X_432750
Company Training DDS Drug Design & Synth.	Ac. Year (September)	36.0	X_432833
Computer-Aided Drug Design and Virtual Screening	Period 2	6.0	X_432673
Drug-induced Stress and Cellular Responses	Period 2	6.0	X_432536
Internship abroad DDS Drug Design & Synth.	Ac. Year (September)	18.0	X_432676
Internship abroad DDS Drug Design & Synth.	Ac. Year (September)	24.0	X_432755
Internship abroad DDS Drug Design & Synth.	Ac. Year (September)	30.0	X_432760
Internship abroad DDS Drug Design & Synth.	Ac. Year (September)	36.0	X_432839
Minor Research Project Biomol. Drug Analysis	Ac. Year (September)	24.0	X_432658
Minor Research Project Biomol. Drug Analysis	Ac. Year (September)	30.0	X_432704
Minor Research Project Biomolecular Drug Analysis	Ac. Year (September)	18.0	X_432689
Minor Research Project DDS Medicinal Chemistry, DD&S	Ac. Year (September)	18.0	X_432692
Minor Research Project DDS Medicinal Chemistry, DD&S	Ac. Year (September)	24.0	X_432693
Minor Research Project DDS Medicinal Chemistry, DD&S	Ac. Year (September)	30.0	X_432705
Minor Research Project DDS Molecular Toxicology, CMCT	Ac. Year (September)	24.0	X_432632
Minor Research Project DDS Molecular Toxicology, DDSA	Ac. Year (September)	24.0	X_432591



Minor Research Project DDS Molecular Toxicology, DDSA	Ac. Year (September)	30.0	X_432592
Minor Research Project DDS Molecular Toxicology, DDSA	Ac. Year (September)	18.0	X_432620
Minor Research Project DDS, CMCT	Ac. Year (September)	18.0	X_432507
Minor Research Project DDS, CMCT	Ac. Year (September)	30.0	X_432707
Minor Research Project Med. Chem., Drug Disc. & Target Find.	Ac. Year (September)	18.0	X_432696
Minor Research Project Med. Chem., Drug Disc. & Target Find.	Ac. Year (September)	30.0	X_432706
Minor Research Project Med. Chem., Drug Disc. & Target Find.	Ac. Year (September)	24.0	X_432635
Signal Transduction in Health and Disease	Period 2	6.0	X_432535

## Compulsory Courses

Courses:

Name	Period	Credits	Code
Literature thesis and Colloquium DDS Medical Chemistry, DD&S	Ac. Year (September)	12.0	X_432573
Physical-Organic Chemistry	Period 1	6.0	X_435663
Synthetic Approaches in Medicinal Chemistry	Period 2	6.0	X_435685

## Compulsory courses research master DDS

Courses:

Name	Period	Credits	Code
ADMET	Period 1	6.0	X_432721
Chemical Biology	Period 1	6.0	X_432538
Drug Action	Period 3	6.0	X_432724
Project Computational Design and Synthesis of Drugs	Period 4	6.0	X_432734

# Research Variant Biomarkers and CCA

Programme components:

- Ethics and Academic Skills
- Deficiency Courses
- Choose 1 out of 3
- Compulsory Choice Research Project (Major) including Report
- Elective Space
- Compulsory Courses
- Compulsory courses research master DDS

## Ethics and Academic Skills

In consultation with the master coordinator and depending on the chosen specialization, 6 EC have to be chosen from the following list.

Courses:

Name	Period	Credits	Code
Business Management in Health and Life Sciences	Period 2	6.0	AM_470584
Clinical Development and Clinical Trials	Period 3	3.0	AM_1180
Communication, Organization and Management	Period 2	6.0	AM_470572
Entrepreneurship in Health and Life Sc.	Period 2	6.0	AM_470575
Epidemiology	Period 3	3.0	AM_1179
Ethics and Academic skills	Ac. Year (September)	1.0	X_432725
Ethics and Academic skills	Ac. Year (September)	2.0	X_432726
Ethics and Academic Skills	Ac. Year (September)	6.0	X_437556
Ethics and Academic Skills	Ac. Year (September)	3.0	X_432517
Ethics in Life Sciences	Period 3	3.0	AM_470707
Managing Science and Technology in Society	Period 1	6.0	AM_470586
Research methods for analyzing complex problems	Period 1	6.0	AM_1182
Science and Communication	Period 1	6.0	AM_470587
Science in Dialogue	Period 2	6.0	AM_1002
Science Journalism	Period 2	6.0	AM_471014
Scientific Writing in English	Period 2, Period 6	3.0	X_400592
Teaching Assistant	Ac. Year (September)	3.0	X_432741
Teaching Assistant	Ac. Year (September)	6.0	X_432742
Tutoring Students	Period 2	3.0	X_432625

## Deficiency Courses

Compulsory course for students without a Bachelor degree Pharmaceutical Sciences VU.

Niet gedefinieerd; Alle vakken starten met een recapitulatie van de benodigde voorkennis

Courses:

Name	Period	Credits	Code
<a href="#">Principles of Pharmaceutical Sciences / Pharmacology</a>	Period 1	6.0	X_435675

## Choose 1 out of 3

Choice of 1 out of 3 subjects depending on the Major Project (to be discussed with the master coordinator)

Courses:

Name	Period	Credits	Code
<a href="#">High-Throughput Screening</a>	Period 2	6.0	X_435047
<a href="#">Mass Spectrometry</a>	Period 2	6.0	X_435604
<a href="#">Protein Analysis</a>	Period 5	6.0	X_435045

## Compulsory Choice Research Project (Major) including Report

Compulsory choice of minimal 42 EC.

Courses:

Name	Period	Credits	Code
<a href="#">Major Research Project Biomol. Drug Analysis</a>	Ac. Year (September)	42.0	X_432564
<a href="#">Major Research Project Biomol. Drug Analysis</a>	Ac. Year (September)	48.0	X_432567
<a href="#">Major Research Project Biomol. Drug Analysis</a>	Ac. Year (September)	54.0	X_432568
<a href="#">Major Research Project Biomol. Drug Analysis</a>	Ac. Year (September)	60.0	X_432569

## Elective Space

Students need to select 30, 24, 18 or 12 EC from the following list:

Courses:

Name	Period	Credits	Code
Biomolecular Simulation in Medicinal Chemistry and Toxicology	Period 5+6	6.0	X_432664
Company Training DDS Biomol. Drug Analysis	Ac. Year (September)	18.0	X_432670
Company Training DDS Biomol. Drug Analysis	Ac. Year (September)	24.0	X_432743
Company Training DDS Biomol. Drug Analysis	Ac. Year (September)	30.0	X_432748
Company Training DDS Biomol. Drug Analysis	Ac. Year (September)	36.0	X_432832
Computer-Aided Drug Design and Virtual Screening	Period 2	6.0	X_432673
Drug-induced Stress and Cellular Responses	Period 2	6.0	X_432536
Internship abroad DDS Biomol. Drug Analysis	Ac. Year (September)	18.0	X_432674
Internship abroad DDS Biomol. Drug Analysis	Ac. Year (September)	24.0	X_432753
Internship abroad DDS Biomol. Drug Analysis	Ac. Year (September)	30.0	X_432758
Internship abroad DDS Biomol. Drug Analysis	Ac. Year (September)	36.0	X_432837
Minor Research Project Biomol. Drug Analysis	Ac. Year (September)	24.0	X_432658
Minor Research Project Biomol. Drug Analysis	Ac. Year (September)	30.0	X_432704
Minor Research Project Biomolecular Drug Analysis	Ac. Year (September)	18.0	X_432689
Minor Research Project DDS Medicinal Chemistry, DD&S	Ac. Year (September)	18.0	X_432692
Minor Research Project DDS Medicinal Chemistry, DD&S	Ac. Year (September)	24.0	X_432693
Minor Research Project DDS Medicinal Chemistry, DD&S	Ac. Year (September)	30.0	X_432705
Minor Research Project DDS Molecular Toxicology, CMCT	Ac. Year (September)	24.0	X_432632
Minor Research Project DDS Molecular Toxicology, DDSA	Ac. Year (September)	24.0	X_432591

Minor Research Project DDS Molecular Toxicology, DDSA	Ac. Year (September)	30.0	X_432592
Minor Research Project DDS Molecular Toxicology, DDSA	Ac. Year (September)	18.0	X_432620
Minor Research Project DDS, CMCT	Ac. Year (September)	18.0	X_432507
Minor Research Project DDS, CMCT	Ac. Year (September)	30.0	X_432707
Minor Research Project Med. Chem., Drug Disc. & Target Find.	Ac. Year (September)	18.0	X_432696
Minor Research Project Med. Chem., Drug Disc. & Target Find.	Ac. Year (September)	30.0	X_432706
Minor Research Project Med. Chem., Drug Disc. & Target Find.	Ac. Year (September)	24.0	X_432635
Signal Transduction in Health and Disease	Period 2	6.0	X_432535

## Compulsory Courses

Compulsory courses

Courses:

Name	Period	Credits	Code
Bio-analysis & Clinical Diagnostics	Period 1	6.0	X_432765
Literature thesis and Colloquium	Ac. Year (September)	12.0	X_432577

## Compulsory courses research master DDS

Courses:

Name	Period	Credits	Code
ADMET	Period 1	6.0	X_432721
Chemical Biology	Period 1	6.0	X_432538
Drug Action	Period 3	6.0	X_432724
Project Computational Design and Synthesis of Drugs	Period 4	6.0	X_432734

## Double Degree

Programme components:

- Ethics and Academic Skills
- Deficiency Courses
- Elective Space
- Choice Thesis 1 out of 5
- Compulsory Courses
- Compulsory courses research master DDS

## Ethics and Academic Skills

In consultation with the master coordinator and depending on the chosen specialization, 6 EC have to be chosen from the following list.

Courses:

Name	Period	Credits	Code
Business Management in Health and Life Sciences	Period 2	6.0	AM_470584
Clinical Development and Clinical Trials	Period 3	3.0	AM_1180
Communication, Organization and Management	Period 2	6.0	AM_470572
Entrepreneurship in Health and Life Sc.	Period 2	6.0	AM_470575
Epidemiology	Period 3	3.0	AM_1179
Ethics and Academic skills	Ac. Year (September)	1.0	X_432725
Ethics and Academic skills	Ac. Year (September)	2.0	X_432726
Ethics and Academic Skills	Ac. Year (September)	6.0	X_437556
Ethics and Academic Skills	Ac. Year (September)	3.0	X_432517
Ethics in Life Sciences	Period 3	3.0	AM_470707
Managing Science and Technology in Society	Period 1	6.0	AM_470586
Research methods for analyzing complex problems	Period 1	6.0	AM_1182
Science and Communication	Period 1	6.0	AM_470587
Science in Dialogue	Period 2	6.0	AM_1002
Science Journalism	Period 2	6.0	AM_471014
Scientific Writing in English	Period 2, Period 6	3.0	X_400592
Teaching Assistant	Ac. Year (September)	3.0	X_432741
Teaching Assistant	Ac. Year (September)	6.0	X_432742
Tutoring Students	Period 2	3.0	X_432625

## Deficiency Courses

Compulsory course for students without a Bachelor degree Pharmaceutical Sciences VU.

Niet gedefinieerd; Alle vakken starten met een recapitulatie van de benodigde voorkennis

Courses:

Name	Period	Credits	Code
<a href="#">Principles of Pharmaceutical Sciences / Pharmacochemistry</a>	Period 1	6.0	X_435675

## Elective Space

Courses:

Name	Period	Credits	Code
<a href="#">Advanced Course on Drug Disp. &amp; Safety Assessment (Mol.Tox.)</a>	Period 5+6	6.0	X_435681
<a href="#">Bio-analysis &amp; Clinical Diagnostics</a>	Period 1	6.0	X_432765
<a href="#">Biomolecular Simulation in Medicinal Chemistry and Toxicology</a>	Period 5+6	6.0	X_432664
<a href="#">Computer-Aided Drug Design and Virtual Screening</a>	Period 2	6.0	X_432673
<a href="#">Drug-induced Stress and Cellular Responses</a>	Period 2	6.0	X_432536
<a href="#">Minor Research Project Biomolecular Drug Analysis</a>	Ac. Year (September)	18.0	X_432689
<a href="#">Minor Research Project DDS Molecular Toxicology, DDSA</a>	Ac. Year (September)	18.0	X_432620
<a href="#">Minor Research Project DDS, CMCT</a>	Ac. Year (September)	18.0	X_432507
<a href="#">Minor Research Project Med. Chem., Drug Disc. &amp; Target Find.</a>	Ac. Year (September)	18.0	X_432696
<a href="#">Physical-Organic Chemistry</a>	Period 1	6.0	X_435663
<a href="#">Signal Transduction in Health and Disease</a>	Period 2	6.0	X_432535
<a href="#">Synthetic Approaches in Medicinal Chemistry</a>	Period 2	6.0	X_435685

## Choice Thesis 1 out of 5

Courses:

Name	Period	Credits	Code
<a href="#">Colloquium and Literature Thesis DDS MC, CMCT</a>	Ac. Year (September)	12.0	X_432576
<a href="#">Colloquium and Literature Thesis DDS MC, DDTF</a>	Ac. Year (September)	12.0	X_432574
<a href="#">Literature thesis and Colloquium</a>	Ac. Year (September)	12.0	X_432577
<a href="#">Literature thesis and Colloquium DDS Medical Chemistry, DD&amp;S</a>	Ac. Year (September)	12.0	X_432573
<a href="#">Literature thesis and Colloquium DDS Molecular Toxicology, DDSA</a>	Ac. Year (September)	12.0	X_432575

## Compulsory Courses

Courses:

Name	Period	Credits	Code
<a href="#">ADMET</a>	Period 1	6.0	X_432721
<a href="#">Chemical Biology</a>	Period 1	6.0	X_432538
<a href="#">Drug Action</a>	Period 3	6.0	X_432724
<a href="#">Project Computational Design and Synthesis of Drugs</a>	Period 4	6.0	X_432734

## Compulsory courses research master DDS

Courses:

Name	Period	Credits	Code
<a href="#">ADMET</a>	Period 1	6.0	X_432721
<a href="#">Chemical Biology</a>	Period 1	6.0	X_432538
<a href="#">Drug Action</a>	Period 3	6.0	X_432724
<a href="#">Project Computational Design and Synthesis of Drugs</a>	Period 4	6.0	X_432734

## Social Variant



Due to the growing complexity of technological and medical issues and the interaction with society, organisations working in this sector have a growing and urgent need for academic professionals in the natural and life sciences, who have knowledge of policy management and entrepreneurship. The Society oriented variant offers students with a bachelor degree in the natural and life sciences the chance to combine a specialization in this field with a specialization in research.

To complete the entire Master programme (120 EC) of the Communication, education or social variant, the student has to choose 60 EC in DDS courses.

Programme components:

- [DDS Courses](#)
- [Recommended Optional Courses](#)
- [Compulsory Courses](#)

## DDS Courses

This specialization is intended for students with a BSc degree in any of the bèta-studies who want to specialize in communication. The programme focuses on science communication theory, research and practice. The programme of the communication (C) specialization is 1 year (60 credits). This specialization may not be combined with the Societal specialization (M) or the Education specialization (E). C-courses are shared with master students from the Faculty of Earth and Life Sciences.

To complete the entire Master programme (120 EC) of the Communication, education or social variant, the student has to choose 60 EC in DDS courses.

Programme components:

- [Specialisation Courses](#)
- [Literature and Colloquium \(compulsory choose 1 of 5\)](#)
- [DDS Research Project \(choose 1 of 5\) \(24 EC\)](#)
- [Deficiency Courses](#)

## Specialisation Courses

In consultation with the master coordinator and depending on the chosen specialization, 6 EC have to be chosen from the following list.

Courses:

Name	Period	Credits	Code
<a href="#">ADMET</a>	Period 1	6.0	X_432721
<a href="#">Biomolecular Simulation in Medicinal Chemistry and Toxicology</a>	Period 5+6	6.0	X_432664
<a href="#">Chemical Biology</a>	Period 1	6.0	X_432538

Computer-Aided Drug Design and Virtual Screening	Period 2	6.0	X_432673
Drug Action	Period 3	6.0	X_432724
Drug-induced Stress and Cellular Responses	Period 2	6.0	X_432536
Mass Spectrometry	Period 2	6.0	X_435604
Physical-Organic Chemistry	Period 1	6.0	X_435663
Project Computational Design and Synthesis of Drugs	Period 4	6.0	X_432734
Signal Transduction in Health and Disease	Period 2	6.0	X_432535
Synthetic Approaches in Medicinal Chemistry	Period 2	6.0	X_435685

## Literature and Colloquium (compulsory choose 1 of 5)

Students need to select a total of 6 EC or more from the following list.

Note: Every programme, including the choice of optional courses, has to be discussed and agreed upon with the master coordinator or a personal mentor and approved by the Examination Board.

Courses:

Name	Period	Credits	Code
Colloquium and Literature Thesis CMCT (C,E,M)	Ac. Year (September)	6.0	X_432571
Colloquium and Literature Thesis DDS BDA (C,E,M)	Ac. Year (September)	6.0	X_432570
Colloquium and Literature Thesis DDS MC, DD&S (C,E,M)	Ac. Year (September)	6.0	X_432623
Colloquium and Literature Thesis DDS MC, DDTF (C,E,M)	Ac. Year (September)	6.0	X_432624
Colloquium and Literature Thesis DDS Molecular Toxicology, DDSA (C,E,M)	Ac. Year (September)	6.0	X_432572

## DDS Research Project (choose 1 of 5) (24 EC)

Students need to select at least 30 credits or more from the following list.

Note: Every programme, including the choice of optional courses, has to be discussed and agreed upon with the master coordinator or a personal mentor and approved by the Examination Board.

Courses:

Name	Period	Credits	Code
Major Research Project DDS Biomolecular Drug Analysis (C,E,M)	Ac. Year (September)	24.0	X_432727
Major Research Project DDS Medicinal Chemistry, DD&S	Ac. Year (September)	24.0	X_432728
Major Research Project DDS Medicinal Chemistry, DDTF	Ac. Year (September)	24.0	X_432729
Major Research Project DDS Molecular Toxicology, CMCT	Ac. Year (September)	24.0	X_432730
Major Research Project DDS Molecular Toxicology, DDSA (C,E,M)	Ac. Year (September)	24.0	X_432731

## Deficiency Courses

Compulsory course for students without a Bachelor degree Pharmaceutical Sciences VU.

Niet gedefinieerd; Alle vakken starten met een recapitulatie van de benodigde voorkennis

Courses:

Name	Period	Credits	Code
Principles of Pharmaceutical Sciences / Pharmacochemistry	Period 1	6.0	X_435675

## Recommended Optional Courses

Courses:

Name	Period	Credits	Code
Business Management in Health and Life Sciences	Period 2	6.0	AM_470584
Clinical Development and Clinical Trials	Period 3	3.0	AM_1180
Entrepreneurship in Health and Life Sc.	Period 2	6.0	AM_470575
Epidemiology	Period 3	3.0	AM_1179
Policy, Politics and Participation	Period 2	6.0	AM_470589

## Compulsory Courses

Courses:

Name	Period	Credits	Code
<a href="#">Analysis of Governmental Policy</a>	Period 1	6.0	AM_470571
<a href="#">Communication, Organization and Management</a>	Period 2	6.0	AM_470572
<a href="#">Internship Societal Specialisation</a>	Ac. Year (September)	30.0	AM_471147
<a href="#">Research methods for analyzing complex problems</a>	Period 1	6.0	AM_1182

## ADMET

<b>Course code</b>	X_432721 ()
<b>Period</b>	Period 1
<b>Credits</b>	6.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. J.N.M. Commandeur
<b>Examinator</b>	dr. J.N.M. Commandeur
<b>Teaching staff</b>	dr. J.N.M. Commandeur
<b>Teaching method(s)</b>	Lecture
<b>Level</b>	400

### Course objective

To get familiar with the biochemical and physiological processes underlying the pharmacokinetics and adverse side effects of drugs, and strategies to improve ADMET-properties by structural modification

### Course content

Of the thousands of novel compounds that are developed by drug discovery project teams, only a fraction have the appropriate pharmacokinetic properties to become a drug product. Pharmacokinetics is determined by the complex processes involved in absorption (A), distribution (D), metabolism (M) and excretion (E) of the drug, the so-called ADME-processes. Furthermore, 20% of the drug entering the clinical development phase fail, because of unwanted/toxic (T) side-effects.

In this course, the students will be familiarized with:

- the pharmacokinetic concepts and the mathematical models by which the time-course of plasma- and tissueconcentration of a drug can be described and which plays an important role in identification of the pharmacokinetic defect(s) of a drug.
- experimental and computational approaches used to predict the ADMET-properties of a new chemical entity;
- the relationship between physico-chemical properties (pKa, logP, logD, solubility, permeability, etc) and ADME-properties, and analytical-

chemical approaches to determine physico-chemical properties;

- role of drug metabolism in adverse drug reactions: metabolic stability, drug-drug interactions, active metabolites, genetic polymorphism
- strategies to improve ADME-properties by structural modification of compounds;
- Covalent drugs

#### Form of tuition

lectures and case studies.

#### Type of assessment

Written exam and case reports.

#### Course reading

Book: 'Drug-like properties: concepts, structure design and methods. From ADME to Toxicity optimization.' Eds. E.H. Kerns and L. Di, Academic Press, 2008, ISBN: 978-0-1236-9520-8.

#### Target group

mDDS-BCCA, mDDS-CMCT, mDDS-DD&S, mDDS-DDSA, mDDS-DDTF, mDDS-C-var, mDDS-E-var, mDDS-M-var

### Advanced Course on Drug Disp. & Safety Assessment (Mol.Tox.)

<b>Course code</b>	X_435681 (435681)
<b>Period</b>	Period 5+6
<b>Credits</b>	6.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	prof. dr. N.P.E. Vermeulen
<b>Examinator</b>	prof. dr. N.P.E. Vermeulen
<b>Teaching method(s)</b>	Seminar
<b>Level</b>	500

#### Course objective

Obtaining an in-depth overview and knowledge of drug disposition and safety assessment, with emphasis on molecular and biochemical mechanisms.

#### Course content

After a general introduction in toxicology, drug absorption, drug distribution, drug elimination, drug metabolism and toxickinetics will be treated. More general mechanisms of toxicity, such as mutagenesis, carcinogenesis, developmental toxicity and idiosyncratic drug reactions, will then be treated. Subsequently, organ-selective toxicities of drugs and other chemicals will be treated, with special emphasis on molecular and biochemical mechanism and structure dependencies. Methods to test toxicities as well as the evaluation of toxicities in terms of safety and health risks will also be treated. Special attention will be given to biotransformation enzymes and their role in drug toxication and detoxication and to the most recent developments in molecular toxicology.

**Type of assessment**

Written examination, blackboard and cases.

**Course reading**

Casarett, and Doull, Toxicology: The Basic Science of Poisons 7th ed.  
New York: Pergamon Press (ISBN 987-0-07-147051-3).  
Selected research papers.

**Entry requirements**

Courses "Molecular pharmacology & toxicology of drugs and/or Drug toxicity: concepts and experimental approaches" or equivalent courses are advised.

**Target group**

mDDS-DDSA, mDDS-DDTF

**Analysis of Governmental Policy**

<b>Course code</b>	AM_470571 ()
<b>Period</b>	Period 1
<b>Credits</b>	6.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Fac. der Aard- en Levenswetenschappen
<b>Coordinator</b>	M.J. Kishna
<b>Examinator</b>	prof. dr. J.T. de Cock Buning
<b>Teaching staff</b>	prof. dr. J.T. de Cock Buning
<b>Teaching method(s)</b>	Lecture, Study Group, Computer lab
<b>Level</b>	500

**Course objective**

- To acquire critical knowledge regarding different policy models and theories
- To master the correct use of central concepts in political and policy discourses.
- To further deepen your analytic skills with respect to the critical assessment of a complex societal question or dilemma in the health and life science;
- To learn to integrate science- specific knowledge with the knowledge and skills of other disciplines of the social sciences
- To practice skills in data collection and analysis
- To learn to set up valid lines of argumentation;
- To learn to translate research findings into policy recommendations;
- To get experienced in writing a policy advisory report;
- To improve your communication skills;
- To improve your skills in working effectively in a project team, through team building, team analysis and feedback.

**Course content**

Governmental policy affects millions of people and is thus object of intensive debate and target of strong societal forces, like political parties, media and interest groups. Being an advisor or policy maker requires a thorough understanding of the dynamics of policy making, as well as from the psychological side as from the more social structures and their influence on a deliberative democracy.  
The course contains several lectures on theoretical concepts and models

concerning policy analysis. Furthermore you will be challenged, under supervision, to apply and practice these concepts and models in the project assignment. From the very first day, you will be part of a project team of about ten students. You are confronted with a real policy problem from an external commissioning institution (e. g. a non-governmental organization, a Ministry, an advisory council). Within those 4 weeks you will collect data by literature review and interviews and conduct an interdisciplinary analysis on the basis of which you provide an advice. Specific attention is paid to working in a project team and team building. At the end of the course, you prepare an advisory report. On the last day of the course you present the report to the representative of the external institution who commissioned the project. In that presentation your team will highlight the main results of your analysis and defend the recommendations you propose.

### Form of tuition

Analysis of Governmental Policy is a fulltime course of four weeks (6 ECTS). The most recent course schedule is to be found on Blackboard. Tuition methods include lectures, training workshops, and self-study. The different elements have the following study time:

- lectures: 15 hours
- project and self-study: remaining hours (within the project: 18x 1 hour coach meeting)
- examination: 2 hours

Please note that attendance to the project meetings is compulsory. Attendance to the lectures is highly recommended. In our experience, relying on self-study alone is insufficient to pass the exam

### Type of assessment

Written exam (25%) and individual evaluation based on personal performance in the project team (50%), and assessment of various group products (report and presentation (25%)). All parts have to be passed successfully.

### Course reading

Buse, Mays and Walt: "Making Health Policy" McGrawHill/Open University press. (at least 2nd edition 2012).

### Recommended background knowledge

The project integrates the learned lessons from the first compulsory MPA courses: Qualitative & Quantitative Methods.\

### Target group

Compulsory course within the Masterprogramme Management, Policy Analysis and entrepreneurship for the health and life sciences (MPA) and the Societal differentiation of Health, Life and Natural Sciences Masters programmes.

### Remarks

The case is policy analysis and advice, but the exercised methods and skills are equally applicable to strategic marketing advice or evaluation studies. The teams will be coached by workgroup leaders.

## Applied Theoretical Chemistry

<b>Course code</b>	X_432501 (432501)
<b>Period</b>	Ac. Year (September)

<b>Credits</b>	12.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	prof. dr. F.M. Bickelhaupt
<b>Examinator</b>	prof. dr. F.M. Bickelhaupt
<b>Level</b>	500

### Course objective

Understanding and predicting molecular structure and chemical reactivity.

### Course content

Theoretical Chemistry has become an integral part of modern chemistry. Numerous properties can be computed with chemical accuracy, thus, enabling one to study or predict quantities that are hardly or not at all accessible through experimental techniques. But with this, the potential of theoretical chemistry is still not exhausted. In order to design syntheses, catalysts or pharmacologically active molecules in a more rational fashion (i.e., instead of using a trial-and-error approach), it is of crucial importance to combine accuracy with solid and profound insight into the underlying mechanisms in the electronic structure. This holds true also if such investigations are done in the form of computational chemistry. Such insight can be obtained through detailed analyses of the computed wavefunction and bond energy. The purpose of this course is to acquire the skills that one needs for a minute understanding of the nature of a chemical phenomenon. Here, the molecular orbital (MO) model contained in the so-called Kohn-Sham density functional theory plays a pivotal role.

### Form of tuition

The course consists of an intensive theoretical introduction in the first week followed by a research project in which the student participates in one of the research lines of the group.

### Type of assessment

Examination of the course occurs on the basis of a research report.

### Course reading

Parts of: (a) T. A. Albright, J. K. Burdett, M.-H. Whangbo, *Orbital Interactions in Chemistry*, Wiley-Interscience, New York, 1985; (b) F.M. Bickelhaupt, E.J. Baerends, *Kohn-Sham Density Functional Theory: Predicting and Understanding Chemistry*, in: *Rev. Comput. Chem.*; K.B. Lipkowitz, D.B. Boyd, Eds.; Wiley-VCH: New York, Vol. 15.

### Recommended background knowledge

BSc Scheikunde of BSc Farmaceutische Wetenschappen

### Target group

MSc Chemistry en MSc DDS

## Applied Theoretical Chemistry

<b>Course code</b>	X_435612 (435612)
<b>Period</b>	Period 4
<b>Credits</b>	6.0



<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	prof. dr. F.M. Bickelhaupt
<b>Examinator</b>	prof. dr. F.M. Bickelhaupt
<b>Teaching staff</b>	prof. dr. F.M. Bickelhaupt
<b>Teaching method(s)</b>	Education, Computer lab
<b>Level</b>	500

### Course objective

Understanding and predicting molecular structure and chemical reactivity.

### Course content

Theoretical Chemistry has become an integral part of modern chemistry. Numerous properties can be computed with chemical accuracy, thus, enabling one to study or predict quantities that are hardly or not at all accessible through experimental techniques. But with this, the potential of theoretical chemistry is still not exhausted. In order to design syntheses, catalysts or pharmacologically active molecules in a more rational fashion (i.e., instead of using a trial-and-error approach), it is of crucial importance to combine accuracy with solid and profound insight into the underlying mechanisms in the electronic structure. This holds true also if such investigations are done in the form of computational chemistry. Such insight can be obtained through detailed analyses of the computed wavefunction and bond energy. The purpose of this course is to acquire the skills that one needs for a minute understanding of the nature of a chemical phenomenon. Here, the molecular orbital (MO) model contained in the so-called Kohn-Sham density functional theory plays a pivotal role.

### Form of tuition

The course consists of an intensive theoretical introduction in the first week followed by a research project in which the student participates in one of the research lines of the group.

### Type of assessment

Examination of the course occurs on the basis of a research report.

### Course reading

Parts of: (a) T. A. Albright, J. K. Burdett, M.-H. Whangbo, *Orbital Interactions in Chemistry*, Wiley-Interscience, New York, 1985; (b) F.M. Bickelhaupt, E.J. Baerends, *Kohn-Sham Density Functional Theory: Predicting and Understanding Chemistry*, in: *Rev. Comput. Chem.*; K.B. Lipkowitz, D.B. Boyd, Eds.; Wiley-VCH: New York, Vol. 15.

### Target group

mCh, mDDS

### Remarks

This course exists in two variants. The first variant is worth 6 cp (code 435612) and can be extended to 12 cp (code 432501).

## Bio-analysis & Clinical Diagnostics

<b>Course code</b>	X_432765 ()
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<b>Period</b>	Period 1
<b>Credits</b>	6.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. H. Lingeman
<b>Examinator</b>	dr. H. Lingeman
<b>Teaching staff</b>	dr. H. Lingeman
<b>Teaching method(s)</b>	Lecture
<b>Level</b>	400

### Course objective

Giving a clear account on the instrumental bio-analytical techniques and strategies in bio-analysis and clinical diagnostics.

### Course content

This basic course on bio-analytical and clinical chemistry is focusing on decision trees (strategic decisions) that can be used during the method development and optimization of analytical procedures to determine both endogenous and exogenous compounds in complex biological samples. Approaches and procedures with respect to sampling, sample preparation, separation, spectroscopy, electrochemistry, as well as immunological and enzymatic procedures will be dealt with. Case studies will be used to clarify the decisions that have to be taken.

### Form of tuition

Lectures and tutorials.

### Type of assessment

Written or oral examination.

### Course reading

Hand-outs (electronically available).

### Recommended background knowledge

Basic knowledge of biochemistry, chromatography, electrophoresis and mass spectrometry.

### Target group

mCH-AS, mDDS, mMNS

## Biomolecular Simulation in Medicinal Chemistry and Toxicology

<b>Course code</b>	X_432664 (432664)
<b>Period</b>	Period 5+6
<b>Credits</b>	6.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. D.P. Geerke
<b>Examinator</b>	dr. D.P. Geerke
<b>Teaching staff</b>	dr. C. de Graaf, dr. D.P. Geerke
<b>Teaching method(s)</b>	Lecture
<b>Level</b>	400

**Course objective**

Providing theoretical background on biomolecular simulation and free-energy calculation methods and an overview of recent developments, applications, and trends.

**Course content**

Methods and techniques for calculating molecular energies of biomolecular systems (molecular mechanics / force fields) and for flexibility analysis (conformational search methods).  
Theory (statistical mechanics), method development (algorithms) and application of molecular dynamics simulations and free energy calculations.  
Proper and efficient treatment of nonbonded interactions: force field development, boundary conditions, long-range forces.  
Analysis of simulation data: secondary structure, solvation and thermodynamic properties, transport and correlation.  
Special focus on methods to predict binding affinities from MD simulation (thermodynamic integration, free energy perturbation) and their application.

**Form of tuition**

Lectures, tutorials, exercises, and self-study.

**Type of assessment**

Written or oral examination

**Course reading**

Leach, A.R., Molecular Modelling: Principles and Applications. (ISBN 0-582-38210-6).  
Recent review articles that will be made available via Blackboard.

**Entry requirements**

Course "Computational Design and Synthesis of Drugs"

**Recommended background knowledge**

Course "Computational Design and Synthesis of Drugs"

**Target group**

mDDS

**Remarks**

Please contact the coordinator two weeks prior to the start of the course (e-mail: [d.p.geerke@vu.nl](mailto:d.p.geerke@vu.nl)).

## Business Management in Health and Life Sciences

<b>Course code</b>	AM_470584 ()
<b>Period</b>	Period 2
<b>Credits</b>	6.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Fac. der Aard- en Levenswetenschappen
<b>Coordinator</b>	prof. dr. H.J.H.M. Claassen
<b>Examinator</b>	prof. dr. H.J.H.M. Claassen

<b>Teaching staff</b>	prof. dr. H.J.H.M. Claassen
<b>Teaching method(s)</b>	Lecture, Computer lab
<b>Level</b>	500

### Course objective

- To acquire knowledge and understanding into theory of knowledge valorisation in health and life sciences
- To acquire knowledge and insight in how to organise, protect and finance a business in health and life sciences
- 3To acquire knowledge and understanding into the pharmaceutical industry's business model and business processes
- To acquire knowledge and understanding into the challenges that face the pharmaceutical industry
- To apply newly acquired knowledge and understanding in writing a business plan
- To apply newly acquired knowledge and understanding by solving case examples
- To reflect on and critically evaluate the role of the pharmaceutical industry in the healthcare system
- To learn to autonomously write a business plan

### Course content

As a result of external factors (for example ageing of the population), it is being stated that our healthcare system is under pressure. As a central stakeholder in this healthcare system, the pharmaceutical industry is facing significant challenges the coming years and more than ever, the pharmaceutical industry is challenged to survive. Business Management in the Health and Life Sciences focuses on gaining insight in the pharmaceutical industry, its business model, business processes, challenges, as well as strategies and actions to overcome these challenges.

During the course, prof.dr. Eric Claassen (<http://www.falw.vu.nl/en/research/athena-institute/staff/claassen.asp>) together with highly experienced guest lecturers from the field will teach theoretical and practical knowledge during lectures and seminars. Tangible subjects that will be discussed during the lectures and seminars include the pharmaceutical industry's business model and business processes, intellectual property, portfolio management, finance, risk capital, grants and subsidies, team building and people management, different legal entities, fiscal and legal aspects when starting a new company, SWOT analysis in the life sciences and clinical trials.

The newly acquired knowledge is tested via an assignment (during which students will write either a personal career business plan or a 'real' business plan) and a written exam, both counting for 50% of the final grade.

### Form of tuition

- Lectures: 35h
- Assignment: 4h
- Work on assignment (self study): 40h
- Self-study: remaining hours

### Type of assessment

Written exam: 50%  
Personal Business Plan: 50%  
Both have to be passed

### Course reading

- Osterwalder, A. & Pigneur, Y. (2009). Business model generation. Self-published.
- Kubr, Marchesi & Ilar (McKinsey & company). (1998). Starting up. Achieving success with professional business planning. McKinsey & Company, Inc. The Netherlands, Amstel 344, 1017 AS Amsterdam.

### Target group

Optional course for Master students Management, Policy Analysis and Entrepreneurship in Health and Life Sciences (MPA), Societal differentiation of the Health, Life & Natural Sciences.

### Remarks

Guest lecturers/organisations:

- Robert Al, TU Eindhoven
- Tamar Weenen, VU university
- Esther Pronker, VU university
- Patrick de Boer & Jochem Bosschenbroek, Ttopstart BV
- Bart van Weezenbeek
- Bart Bergstein, Forbion Capital partners
- Michael Mellink & Majorie Soeter, Odgersberndtson
- Marga Janse, innovatief LerenLeren BV
- NL Octrooicentrum
- Price Waterhouse Coopers
- AsjesBisseling Belastingadviseurs
- And others to be announced

## Chemical Biology

<b>Course code</b>	X_432538 (432538)
<b>Period</b>	Period 1
<b>Credits</b>	6.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	prof. dr. R. Leurs
<b>Examinator</b>	prof. dr. R. Leurs
<b>Teaching staff</b>	prof. dr. R. Leurs
<b>Teaching method(s)</b>	Lecture, Computer lab
<b>Level</b>	400

### Course objective

To get students acquainted with modern chemical biology techniques to study proteins and the modulation of their function, with a specific emphasis on drug discovery

### Course content

In this course emphasis will be given on the interface between Chemistry and Biology. How can one understand biological processes using small molecules? How can one identify small molecules targeting new biochemical pathways, either by using modern biochemical or cellular assays (e.g. SPR, FRET, BRET, High-content & High resolution analysis),

or in silico using the wealth of new information from structural biology? How to detect and/or modulate DNA, RNA and protein expression and/or function with chemical probes? These are the questions that are central to this course.

#### **Form of tuition**

lectures, tutorial, consultancy sessions and case study/presentation

#### **Type of assessment**

Students will work in small groups on an integrated case study. Based on primary literature, background information from Comprehensive Medicinal Chemistry, interaction with "Protein Champions", students will work on a "Chemical Biology Protein Report" and oral presentation. Finally, there will be a written examination at the end of the course on the various topics presented in the course.

Final grades will be based on results of the case study (35%), case presentation and discussion (15%) and final exam (50%). Each part must at least be satisfactory (mark "6 out of 10" or higher).

#### **Course reading**

Selected book chapters from Comprehensive Medicinal Chemistry II, 2007, Elsevier, Editors-in-Chief: John B. Taylor and David J. Triggle (available at VU library as e-book) and primary literature.

#### **Entry requirements**

Bachelor Pharmaceutical Sciences, Medical Natural Science, Science, Business and Innovation or Chemistry. Portal course MSc Biomolecular Science or Principles of Pharmaceutical Sciences, Signal Transduction in Health and Disease, or equivalent for mBMS students and students with Bsc SBI of Chemistry.

#### **Target group**

mBMS-BC, mCh-SBI (2nd year), mDDS-BCCA, mDDS-CMCT, mDDS-DD&S, mDDS-DDSA, mDDS-DDTF, mDDS-C-var, mDDS-E-var, mDDS-M-var, mPhys-SBI (2nd year)

#### **Registration procedure**

Please register as soon as possible online.

#### **Remarks**

Presence is obliged at predefined moments of the course (e.g. kick-off meeting, computer practical, presentation session, examination) for finishing the course successfully.

## Clinical Development and Clinical Trials

<b>Course code</b>	AM_1180 ()
<b>Period</b>	Period 3
<b>Credits</b>	3.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Fac. der Aard- en Levenswetenschappen
<b>Coordinator</b>	prof. dr. H.J.H.M. Claassen
<b>Examinator</b>	prof. dr. H.J.H.M. Claassen
<b>Teaching method(s)</b>	Lecture, Study Group
<b>Level</b>	500

### **Course objective**

- to gain knowledge and insight into the function of clinical trials
- to gain knowledge and insight into the design of clinical trials
- to gain knowledge and insight into the conduct of clinical trials, including the applying rules and regulations (including ICH-GCP)
- to gain knowledge and insight into and reflect on the roles, tasks and responsibilities of the stakeholders involved in clinical trials
- to reflect on the role of golden standard in our healthcare system
- to learn where and how to look up rules and regulations.

### **Course content**

In today's healthcare system, clinical trials have gained the status of golden standard to test the safety and efficacy of newly developed drugs. For new drugs to enter the market, clinical trials must be passed and as a consequence, clinical trial outcomes have major effects on our healthcare system. While our healthcare system currently is under pressure to remain affordable and available to all, at the same time, clinical trial regulations are increasingly tightened and the prominence of clinical trials in our healthcare system is being criticized. For that matter, it is of great importance to learn about and reflect on the role of clinical trials in today's healthcare system.

The Clinical Development & Clinical Trials course will elaborate on the function, design and conduct of clinical trials, as well as the relevant stakeholders involved. The course consists of a theoretical part and an important practical part (e.g. gaining knowledge on clinical trial regulations). Classes include for example: 'Life Cycle of a Clinical Trial', 'Clinical Trial Methodology', 'ICH-GCP Principles', 'The Ethics Committee', 'Safety Considerations in Clinical Trials', 'Quality Control & Quality Assurance', 'Compliance, Misconduct & Fraud'.

The gained knowledge and skills will be evaluated by means of a written exam at the end of the course.

### **Form of tuition**

Lectures: 35 h.

Self study: remaining hours

### **Type of assessment**

Written exam: 100%.

### **Course reading**

Will be announced on Blackboard 1 month before the start of the course.

### **Target group**

Optional course for Master students Management, Policy Analysis and Entrepreneurship in Health and Life Sciences (MPA), Societal differentiation of the Health, Life & Natural Sciences.

### **Remarks**

Guest lecturers/organisations:

- Eric Klaver
- DOCS
- Others to be announced.

## **Colloquium and Literature Thesis CMCT (C,E,M)**

<b>Course code</b>	X_432571 (432571)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	6.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. D.P. Geerke
<b>Examinator</b>	dr. D.P. Geerke
<b>Level</b>	600

## Colloquium and Literature Thesis DDS BDA (C,E,M)

<b>Course code</b>	X_432570 (432570)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	6.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. H. Lingeman
<b>Examinator</b>	dr. H. Lingeman
<b>Level</b>	600

### Course objective

Literature study on a topic related to biomolecular analysis.

### Course content

The topic will be chosen in close cooperation and with approval of the master coordinator.

### Form of tuition

Selfstudy and discussion sessions.

### Type of assessment

Report and presentations.

### Target group

mDDS

### Remarks

Please contact the coordinator.

## Colloquium and Literature Thesis DDS MC, CMCT

<b>Course code</b>	X_432576 (432576)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	12.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. D.P. Geerke
<b>Examinator</b>	dr. D.P. Geerke
<b>Level</b>	600



**Course objective**

To be able to efficiently retrieve in-depth information about a given scientific topic, logically categorize and describe the information in a thesis, and present the main findings in a colloquium.

**Course content**

Completion of an academic MSc degree does not only imply practical experience and knowledge from the scientific specialization, it also implies that one is able to deal with substantial amounts of scientific information in an efficient way and distill this into the main points. During the literature thesis, the student will collect recent in-depth scientific literature about a given research topic, usually a topic of direct interest to the research group. The literature information is described in a coherent form in a thesis, which is also presented orally during a colloquium.

**Form of tuition**

Self-study, contact hours with supervisor.

**Type of assessment**

Thesis, colloquium.

**Target group**

mDDS-CMCT

**Remarks**

Please contact the coordinator in advance for a discussion and planning of the topic.

**Colloquium and Literature Thesis DDS MC, DD&S (C,E,M)**

<b>Course code</b>	X_432623 (432623)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	6.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. M. Wijtmans
<b>Examinator</b>	dr. M. Wijtmans
<b>Level</b>	600

**Course objective**

To be able to efficiently retrieve in-depth information about a given scientific topic, logically categorize and describe the information in a thesis, and present the main findings in a colloquium.

**Course content**

Completion of an academic MSc degree does not only imply practical experience and knowledge from the scientific specialisation, it also implies that one is able to deal with substantial amounts of scientific information in an efficient way and distill this into the main points. During the literature thesis, the student will collect recent in-depth scientific literature about a given Medicinal Chemistry research topic, usually a topic of direct interest to the research group. The literature information is described in a coherent form in a thesis, which is also

presented orally during a colloquium.

**Form of tuition**

Self-study, contact hours with supervisor.

**Type of assessment**

Thesis, colloquium.

**Course reading**

A guide with general hints and tips on writing a thesis will be provided.

**Target group**

mDDS-DD&S

**Registration procedure**

Please contact the coordinator in advance for a discussion and planning of the topic.

## Colloquium and Literature Thesis DDS MC, DDTF

<b>Course code</b>	X_432574 (432574)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	12.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. M.H. Siderius
<b>Examinator</b>	dr. M.H. Siderius
<b>Level</b>	600

**Course objective**

To be able to efficiently retrieve in-depth information about a given scientific topic, logically categorize and describe the information in a thesis, and present the main findings in a colloquium.

**Course content**

Completion of an academic MSc degree does not only imply practical experience and knowledge from the scientific specialisation, it also implies that one is able to deal with substantial amounts of scientific information in an efficient way and distill this into the main points.

During the literature thesis, the student will collect recent in-depth scientific literature about a given research topic, usually a topic of direct interest to the research group. The literature information is described in a coherent form in a thesis, which is also presented orally during a colloquium.

**Form of tuition**

Self-study, contact hours with supervisor.

**Type of assessment**

Thesis, colloquium.

**Target group**

mDDS-DDTF

**Remarks**

Please contact the coordinator in advance for a discussion and planning of the topic.

**Colloquium and Literature Thesis DDS MC, DDTF (C,E,M)**

<b>Course code</b>	X_432624 (432624)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	6.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. M.H. Siderius
<b>Examinator</b>	dr. M.H. Siderius
<b>Level</b>	600

**Course objective**

To be able to efficiently retrieve in-depth information about a given scientific topic, logically categorize and describe the information in a thesis, and present the main findings in a colloquium.

**Course content**

Completion of an academic MSc degree does not only imply practical experience and knowledge from the scientific specialization, it also implies that one is able to deal with substantial amounts of scientific information in an efficient way and distill this into the main points. During the literature thesis, the student will collect recent in-depth scientific literature about a given research topic, usually a topic of direct interest to the research group. The literature information is described in a coherent form in a thesis, which is also presented orally during a colloquium.

**Form of tuition**

Self-study, contact hours with supervisor.

**Target group**

mDDS-DDTF

**Remarks**

Please contact the coordinator in advance for a discussion and planning of the topic.

**Colloquium and Literature Thesis DDS Molecular Toxicology, DDSA (C,E,M)**

<b>Course code</b>	X_432572 (432572)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	6.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. J.N.M. Commandeur
<b>Examinator</b>	dr. J.N.M. Commandeur
<b>Level</b>	600

**Course objective**

To demonstrate that the student is able to collect relevant and recent primary scientific literature on a predefined subject in the area of molecular and biochemical toxicology, to organize the information in chapters and to draw conclusions on the perspectives or relevance of the subject.

**Course content**

The content of the literature thesis/colloquium depends on the subject which will be selected in consultation with master coordinator dr. JNM Commandeur ([j.n.m.commandeur@vu.nl](mailto:j.n.m.commandeur@vu.nl)).

**Form of tuition**

Literature study

**Type of assessment**

Written literature thesis and oral presentation (colloquium) for the department of Pharmaceutical Sciences.

**Course reading**

Literature study

**Recommended background knowledge**

The courses ADMET, Drug-induced stress and cellular responses or equivalent courses.

**Target group**

mDDS-DDSA MCE-variant

**Remarks**

A list of subjects for the literature thesis and colloquium can be obtained from dr. JNM Commandeur ([j.n.m.commandeur@vu.nl](mailto:j.n.m.commandeur@vu.nl)).

## Communication, Organization and Management

<b>Course code</b>	AM_470572 ()
<b>Period</b>	Period 2
<b>Credits</b>	6.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Fac. der Aard- en Levenswetenschappen
<b>Coordinator</b>	M.J. Kishna
<b>Examinator</b>	M.J. Kishna
<b>Teaching staff</b>	dr. H. Wels, prof. dr. F. Scheele, dr. M.B.M. Zweekhorst
<b>Teaching method(s)</b>	Lecture, Study Group
<b>Level</b>	500

**Course objective**

To get acquainted with theories on organisational behaviour  
To obtain a deeper understanding of communication from the perspective of sharing and influencing results  
To acquire knowledge on organisational structures and designs  
To get acquainted with important theories on organisational transitions and change management

To acquire insight into different management practices in the health and life sciences sector  
 To gain insight in leadership and interpersonal behaviour  
 To obtain insight in methods for motivation and conflict management  
 To improve communication skills  
 To practise analytical and advisory skills

### Course content

Organisations in the health and life science sector are changing fast, a phenomenon driven by newly emerging technologies and increasing societal complexity. A growing number of students with a beta degree will hold professional and managerial functions in these organisations. During this course students will learn how to be effective performers within these environments, both individually and in teams. This requires an understanding of the macro aspects of organisational behaviour, including designing organisations, managerial skills and ways of strategic thinking. Several speakers conduct lectures on aspects as motivation, managing interpersonal behaviour, leadership, communication and developing and changing organisations. The speakers explain theories from literature and relate them to their practical experiences. In addition, the students interview managers in health organisations and analyse these interviews using the newly acquired theoretical concepts. Also, practical cases of health care companies will be analysed and discussed, resulting in advisory reports for management. With the other students you discuss your experiences and a coach helps you relate the experiences to theory.

### Form of tuition

Lectures: approximately 22 hours  
 Response lectures: 4 hours  
 Training workshops 12 hours  
 Self-study and writing project assignment: remaining hours.

### Type of assessment

Written exam (60%;) and assessment of the interviews, case study analysis, and reports (40%). Grades of both parts must at least be 6 or higher.

### Course reading

To be announced on Blackboard

### Target group

Compulsory course within the Master programme Management, Policy Analysis and Entrepreneurship for the Health and Life Sciences (MPA) and the Societal differentiation of Health, Life and Natural Sciences Masters programmes

### Remarks

Attendance to training, workshops, interviews and discussions is indispensable

## Company Training Comp. Med. Chem. & Tox.

<b>Course code</b>	X_432619 (432619)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	18.0
<b>Language of tuition</b>	English

<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. D.P. Geerke
<b>Examinator</b>	dr. D.P. Geerke
<b>Level</b>	500

### Course objective

To obtain experience in doing scientific research in an industrial setting.

### Course content

During a traineeship, the student actively participates in a research project within a company.

### Type of assessment

Report, presentation and practical work.

### Target group

mDDS

### Remarks

Please contact the coordinator well in advance to check for possibilities and to discuss the most suitable duration of the traineeship.

## Company Training Comp. Med. Chem. & Tox.

<b>Course code</b>	X_432744 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	24.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. D.P. Geerke
<b>Examinator</b>	dr. D.P. Geerke
<b>Level</b>	500

### Course objective

To obtain experience in doing scientific research in an industrial setting.

### Course content

During a traineeship, the student actively participates in a research project within a company.

### Type of assessment

Report, presentation and practical work.

### Target group

mDDS

### Remarks

Please contact the coordinator well in advance to check for possibilities and to discuss the most suitable duration of the traineeship.

## Company Training Comp. Med. Chem. & Tox.

<b>Course code</b>	X_432749 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	30.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. D.P. Geerke
<b>Examinator</b>	dr. D.P. Geerke
<b>Level</b>	500

### Course objective

To obtain experience in doing scientific research in an industrial setting.

### Course content

During a traineeship, the student actively participates in a research project within a company.

### Type of assessment

Report, presentation and practical work.

### Target group

mDDS

### Remarks

Please contact the coordinator well in advance to check for possibilities and to discuss the most suitable duration of the traineeship.

## Company Training Comp. Med. Chem. & Tox.

<b>Course code</b>	X_432835 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	36.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. D.P. Geerke
<b>Examinator</b>	dr. D.P. Geerke
<b>Level</b>	500

## Company Training DDS Biomol. Drug Analysis

<b>Course code</b>	X_432670 (432670)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	18.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. J. Kool

<b>Examinator</b>	dr. J. Kool
<b>Level</b>	500

### Course objective

To acquire knowledge and insight into the role and objectives of drug, bio-analytical and clinical development processes.

### Course content

This course aims to provide students with a theoretical and practical understanding of the issues involved in the design, conduct, analysis and interpretation of clinical trails of health interventions.

### Target group

mDDS

### Remarks

For further information please contact Henk Lingeman

## Company Training DDS Biomol. Drug Analysis

<b>Course code</b>	X_432743 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	24.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. H. Lingeman
<b>Examinator</b>	dr. H. Lingeman
<b>Level</b>	500

### Course objective

To acquire knowledge and insight into the role and objectives of drug, bio-analytical and clinical development processes.

### Course content

This course aims to provide students with a theoretical and practical understanding of the issues involved in the design, conduct, analysis and interpretation of clinical trails of health interventions.

### Target group

mDDS

### Remarks

For further information please contact Henk Lingeman

## Company Training DDS Biomol. Drug Analysis

<b>Course code</b>	X_432748 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	30.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. H. Lingeman



<b>Examinator</b>	dr. H. Lingeman
<b>Level</b>	500

### Course objective

To acquire knowledge and insight into the role and objectives of drug, bio-analytical and clinical development processes.

### Course content

This course aims to provide students with a theoretical and practical understanding of the issues involved in the design, conduct, analysis and interpretation of clinical trails of health interventions.

### Target group

mDDS

### Remarks

For further information please contact Henk Lingeman

## Company Training DDS Biomol. Drug Analysis

<b>Course code</b>	X_432832 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	36.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. H. Lingeman
<b>Examinator</b>	dr. H. Lingeman
<b>Level</b>	500

### Course objective

To acquire knowledge and insight into the role and objectives of drug, bio-analytical and clinical development processes.

### Course content

This course aims to provide students with a theoretical and practical understanding of the issues involved in the design, conduct, analysis and interpretation of clinical trials and health intervention.

### Target group

mDDS

## Company Training DDS Drug Design & Synth.

<b>Course code</b>	X_432671 (432671)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	18.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. M. Wijtman
<b>Examinator</b>	dr. M. Wijtman
<b>Level</b>	500

**Course objective**

To obtain experience in doing scientific research in a company setting.

**Course content**

During a traineeship, the student actively participates in a research project within a company.

**Type of assessment**

Report, presentation and practical work.

**Target group**

mDDS

**Registration procedure**

Please contact the coordinator well in advance to check for possibilities and to discuss the most suitable duration of the traineeship.

**Company Training DDS Drug Design & Synth.**

<b>Course code</b>	X_432745 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	24.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. M. Wijtman
<b>Examinator</b>	dr. M. Wijtman
<b>Level</b>	500

**Course objective**

To obtain experience in doing scientific research in a company setting.

**Course content**

During a traineeship, the student actively participates in a research project within a company.

**Type of assessment**

Report, presentation and practical work.

**Target group**

mDDS

**Registration procedure**

Please contact the coordinator well in advance to check for possibilities and to discuss the most suitable duration of the traineeship.

**Company Training DDS Drug Design & Synth.**

<b>Course code</b>	X_432750 ()
<b>Period</b>	Ac. Year (September)

<b>Credits</b>	30.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. M. Wijtmans
<b>Examinator</b>	dr. M. Wijtmans
<b>Level</b>	500

#### **Course objective**

To obtain experience in doing scientific research in a company setting.

#### **Course content**

During a traineeship, the student actively participates in a research project within a company.

#### **Type of assessment**

Report, presentation and practical work.

#### **Target group**

mDDS

#### **Registration procedure**

Please contact the coordinator well in advance to check for possibilities and to discuss the most suitable duration of the traineeship.

### Company Training DDS Drug Design & Synth.

<b>Course code</b>	X_432833 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	36.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. M. Wijtmans
<b>Examinator</b>	dr. M. Wijtmans
<b>Level</b>	500

#### **Course objective**

To obtain experience in doing scientific research in a company setting.

#### **Course content**

During a traineeship, the student actively participates in a research project within a company.

#### **Type of assessment**

Report, presentation and practical work.

#### **Target group**

mDDS

#### **Registration procedure**

Please contact the coordinator well in advance to check for possibilities and to discuss the most suitable duration of the

traineeship.

## Company Training DDS Drug, Disp. and Saf. Assessm.

<b>Course code</b>	X_432672 (432672)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	18.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. J.N.M. Commandeur
<b>Examinator</b>	dr. J.N.M. Commandeur
<b>Level</b>	500

### Course objective

To perform research in the area of molecular and biochemical toxicology and risk assessment in an industrial context.

### Course content

The content of the research training is dependent on the specific company at which the training will take place.

### Form of tuition

Experimental research project.

### Type of assessment

Written report and oral presentation.

### Course reading

Dependent on the project a literature search will have to be performed to be well prepared for the research training.

### Recommended background knowledge

Courses ADMET, Drug-induced stress and cellular signalling, Advanced Course on Drug Disposition and Safety Assessment, or equivalent courses.

### Target group

mDDS-DDSA

### Remarks

Students who want to perform a company training should first ask for approval at the exam committee by sending a short description of the research project and a declaration of the master-coordinator (dr JNM Commandeur; [j.n.m.commandeur@vu.nl](mailto:j.n.m.commandeur@vu.nl)) in which the procedure is described on how the quality and progress of the research project will be monitored and how the final assessment of the project will be organized (usually based on the experimental performance, a written report and final oral presentation). In case (part of) the company training is confidential, on-site inspection of the written report and oral presentation should be arranged in order to evaluate the academic level

|Lecturers:

## Company Training DDS Drug, Disp. and Saf. Assessm.

<b>Course code</b>	X_432746 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	24.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. J.N.M. Commandeur
<b>Examinator</b>	dr. J.N.M. Commandeur
<b>Level</b>	500

### Course objective

To perform research in the area of molecular and biochemical toxicology and risk assessment in an industrial context.

### Course content

Dependent on the specific company at which the training will take place.

### Form of tuition

Experimental research project.

### Type of assessment

Written report and oral presentation.

### Course reading

Dependent on the project a literature search will have to be performed to be well prepared for the research training.

### Recommended background knowledge

Courses ADMET, Drug-induced stress and cellular signalling, Advanced Course on Drug Disposition and Safety Assessment, or equivalent courses.

### Target group

mDDS-DDSA

### Remarks

Students who want to perform a company training should first ask for approval at the exam committee by sending a short description of the research project and a declaration of the master-coordinator (dr JNM Commandeur; [j.n.m.commandeur@vu.nl](mailto:j.n.m.commandeur@vu.nl)) in which the procedure is described on how the quality and progress of the research project will be monitored and how the final assessment of the project will be organized (usually based on the experimental performance, a written report and final oral presentation). In case (part of) the company training is confidential, on-site inspection of the written report and oral presentation should be arranged in order to evaluate the academic level

Lecturers:

dr. J.N.M. Commandeur

## Company Training DDS Drug, Disp. and Saf. Assessm.

<b>Course code</b>	X_432751 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	30.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. J.N.M. Commandeur
<b>Examinator</b>	dr. J.N.M. Commandeur
<b>Level</b>	500

### Course objective

To perform research in the area of molecular and biochemical toxicology and risk assessment in an industrial context.

### Course content

The content of the research training is dependent on the specific company at which the training will take place.

### Form of tuition

Experimental research project.

### Type of assessment

Written report and oral presentation.

### Course reading

Dependent on the project a literature search will have to be performed to be well prepared for the research training.

### Recommended background knowledge

Courses ADMET, Drug-induced stress and cellular signalling, Advanced Course on Drug Disposition and Safety Assessment, or equivalent courses.

### Target group

mDDS-DDSA

### Remarks

Students who want to perform a company training should first ask for approval at the exam committee by sending a short description of the research project and a declaration of the master coordinator (dr JNM Commandeur; [j.n.m.commandeur@vu.nl](mailto:j.n.m.commandeur@vu.nl)) in which the procedure is described on how the quality and progress of the research project will be monitored and how the final assessment of the project will be organized (usually based on the experimental performance, a written report and final oral presentation). In case (part of) the company training is confidential, on-site inspection of the written report and oral presentation should be arranged in order to evaluate the academic level

Lecturers:

dr. J.N.M. Commandeur

dr. J.C. Vos

## Company Training DDS Drug, Disp. and Saf. Assessm.

<b>Course code</b>	X_432834 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	36.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. J.N.M. Commandeur
<b>Examinator</b>	dr. J.N.M. Commandeur
<b>Level</b>	500

### Course objective

To perform research in the area of molecular and biochemical toxicology and risk assessment in an industrial context.

### Course content

The content of the research training is dependent on the specific company at which the training will take place.

### Form of tuition

Experimental research project.

### Type of assessment

Written report and oral presentation.

### Course reading

Dependent on the project a literature search will have to be performed to be well prepared for the research training.

### Recommended background knowledge

Courses ADMET, Drug-induced stress and cellular signalling, Advanced Course on Drug Disposition and Safety Assessment, or equivalent courses.

### Target group

mDDS-DDSA

### Remarks

Students who want to perform a company training should first ask for approval at the exam committee by sending a short description of the research project and a declaration of the master-coordinator (dr JNM Commandeur; [j.n.m.commandeur@vu.nl](mailto:j.n.m.commandeur@vu.nl)) in which the procedure is described on how the quality and progress of the research project will be monitored and how the final assessment of the project will be organized (usually based on the experimental performance, a written report and final oral presentation). In case (part of) the company training is confidential, on-site inspection of the written report and oral presentation should be arranged in order to evaluate the academic level

Lecturers:

dr. J.N.M. Commandeur

dr. J.C. Vos

## Company Training Drug Discovery & Target Finding

<b>Course code</b>	X_432621 (432621)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	18.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. D.P. Geerke
<b>Examinator</b>	dr. D.P. Geerke
<b>Level</b>	500

### Course objective

To obtain experience in scientific research in an industrial setting.

### Course content

During a trainee-ship the student actively participates in a research project.

### Type of assessment

Practical work, report and presentation.

### Target group

mDDS

### Remarks

Please contact the coordinator well in advance.

## Company Training Drug Discovery & Target Finding

<b>Course code</b>	X_432747 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	24.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. M.H. Siderius
<b>Examinator</b>	dr. M.H. Siderius
<b>Level</b>	500

### Course objective

To obtain experience in scientific research in an industrial setting.

### Course content

During a trainee-ship the student actively participates in a research project.

### Type of assessment

Practical work, report and presentation.

### Target group

mDDS



**Remarks**

Please contact the coordinator well in advance.

## Company Training Drug Discovery & Target Finding

<b>Course code</b>	X_432752 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	30.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. M.H. Siderius
<b>Examinator</b>	dr. M.H. Siderius
<b>Level</b>	500

**Course objective**

To obtain experience in scientific research in an industrial setting.  
During a trainee-ship the student actively participates in a research project.  
Practical work, report and presentation.

**Course content**

During a trainee-ship the student actively participates in a research project.

**Type of assessment**

Practical work, report and presentation.

**Target group**

mDDS

**Remarks**

Please contact the coordinator well in advance.

## Company Training Drug Discovery & Target Finding

<b>Course code</b>	X_432836 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	36.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. M.H. Siderius
<b>Examinator</b>	dr. M.H. Siderius
<b>Level</b>	500

## Computer-Aided Drug Design and Virtual Screening

<b>Course code</b>	X_432673 (432673)
<b>Period</b>	Period 2
<b>Credits</b>	6.0

<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. C. de Graaf
<b>Examinator</b>	dr. C. de Graaf
<b>Teaching staff</b>	prof. dr. I.J.P. de Esch, dr. C. de Graaf, dr. D.P. Geerke
<b>Teaching method(s)</b>	Lecture
<b>Level</b>	400

### Course objective

Providing theoretical background on computer-aided drug design and virtual screening, and giving an overview of recent developments, applications and trends.

### Course content

Introduction into most important concepts of computer-aided drug discovery and design.

- Protein homology modeling: sequence alignment methods, modeling constraints, protein-ligand interaction model refinement and validation.
- Chemoinformatics and chemogenomics and their application in drug and drug target identification: annotated ligand and protein databases, similarity searches, molecular fingerprints, machine learning, QSAR, focused library design, molecular field analysis, sequence- and structure-based comparison of binding sites.
- Structure-based virtual screening and design: molecular alignment, pharmacophore modeling, molecular docking and scoring, post-processing filters, protein-ligand interaction fingerprints, de novo design.

Students will learn to recognize the strengths and challenges of different in computer-aided drug design approaches and will learn how in silico methods can be complemented with experimental studies in concrete ligand discovery and design projects.

### Form of tuition

Lectures, case study sessions, and self-study.

### Type of assessment

Written (or oral) examination (60%) and case study (report: 20%, presentation: 15%; participation in case study sessions: 5%)

### Course reading

Computer- Assisted Drug Design (Mason (Ed.) (references to relevant paragraphs from Mason will be included in lecture handouts and will be available as "E-book" via UBVU).

Background information: Chapters from Leach, A.R., Molecular Modelling: Principles and Applications. (ISBN 0-582-38210-6).

Literature that will be made available via Blackboard.

**Target group**

mDDS-CMCT, mDDS-DD&S, mDDS-DDSA, mDDS-DDTF, mDDS-C-var, mDDS-E-var, mDDS-M-var, mCh

## Density Functional Theory for Chemists

<b>Course code</b>	X_435111 (435111)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	6.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	prof. dr. F.M. Bickelhaupt
<b>Examinator</b>	prof. dr. F.M. Bickelhaupt
<b>Level</b>	500

**Course objective**

Understanding basic concepts of Density Functional Theory (DFT), in particular, Kohn-Sham DFT, and its application to understanding and predicting chemical bonding, molecular structure, and reactivity.

**Course content**

Electron density, Hole functions, Electron density as basic variable instead of the wavefunction, Hohenberg-Kohn theorems, Kohn-Sham approach, Approximate exchange-correlation functionals, Basic machinery of DFT computer programs.

**Form of tuition**

Independent study

**Type of assessment**

Oral exam

**Course reading**

Parts of: (a) W. Koch en M. C. Holthausen, A Chemist's Guide to Density Functional Theory; Sec. Ed.; Wiley-VCH Verlag: Weinheim, 2000.; (b) F.M. Bickelhaupt, E.J. Baerends, Kohn-Sham Density Functional Theory: Predicting and Understanding Chemistry, in: Rev. Comput. Chem.; K.B. Lipkowitz, D.B. Boyd, Eds.; Wiley-VCH: New York, Vol. 15.

**Remarks**

Period: in consultation with the lecturer

## Density Functional Theory for Chemists

<b>Course code</b>	X_435112 (435112)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	12.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	prof. dr. F.M. Bickelhaupt
<b>Examinator</b>	prof. dr. F.M. Bickelhaupt
<b>Level</b>	500

### Course objective

Understanding basic concepts of Density Functional Theory (DFT), in particular, Kohn-Sham DFT, and its application to understanding and predicting chemical bonding, molecular structure, and reactivity.

### Course content

Part I (6 ECTS): Electron density, Hole functions, Electron density as basic variable instead of the wavefunction, Hohenberg-Kohn theorems, Kohn-Sham approach, Approximate exchange-correlation functionals, Basic machinery of DFT computer programs. Part II (6 ECTS): Molecular structure, Vibrational frequencies, Thermochemistry, Hydrogen bonds, Kohn-Sham molecular orbital (MO) model of the electronic structure and chemical bond, Chemical reactivity.

### Form of tuition

zelfstudie

### Type of assessment

Oral examination.

### Course reading

Parts of: (a) W. Koch en M. C. Holthausen, A Chemist's Guide to Density Functional Theory; Sec. Ed.; Wiley-VCH Verlag: Weinheim, 2000.; (b) F.M. Bickelhaupt, E.J. Baerends, Kohn-Sham Density Functional Theory: Predicting and Understanding Chemistry, in: Rev. Comput. Chem.; K.B. Lipkowitz, D.B. Boyd, Eds.; Wiley-VCH: New York, Vol. 15; (c) Other selected tutorial reviews (in consultation).

### Target group

mCh, mPhar

### Remarks

Period: in consultation with the lecturer

### Didactiek 1

<b>Course code</b>	O_MLDIDAC_1 ()
<b>Period</b>	Period 1, Period 4
<b>Credits</b>	6.0
<b>Language of tuition</b>	Dutch
<b>Faculty</b>	Fac. der Gedrags- en Bewegingswetensch.
<b>Coordinator</b>	C.L. Geraedts
<b>Examinator</b>	dr. A. Handelzalts
<b>Teaching staff</b>	drs. J.K.W. Riksen, drs. H.R. Goudsmit, drs. Y.G. Meindersma, ir. E.J.F. Scheringa, drs. W.S. Hoekstra, drs. C.D.P. van Oeveren, drs. S. Donszelmann, drs. B. Klein, drs. W. Jongejan, drs. L.J. van Well-van Grootheest, dr. H.B. Westbroek, C.L. Geraedts, drs. A. Krijgsman, dr. A.A. Kaal, dr. A. Handelzalts, drs. K.L. Schaap, W. Maas, F.L. de Vries MSc, drs. H. Stouthart, drs. I. Pauw
<b>Teaching method(s)</b>	Lecture, Study Group
<b>Level</b>	400

## Didactiek 2

<b>Course code</b>	O_MLDIDAC_2 ()
<b>Period</b>	Period 2+3, Period 5+6
<b>Credits</b>	6.0
<b>Language of tuition</b>	Dutch
<b>Faculty</b>	Fac. der Gedrags- en Bewegingswetensch.
<b>Coordinator</b>	drs. B. Klein
<b>Examinator</b>	dr. A. Handelzalts
<b>Teaching staff</b>	drs. J.K.W. Riksen, drs. H.R. Goudsmit, drs. Y.G. Meindersma, ir. E.J.F. Scheringa, drs. W.S. Hoekstra, drs. C.D.P. van Oeveren, drs. S. Donszelmann, drs. B. Klein, drs. W. Jongejan, drs. L.J. van Well-van Grootheest, dr. H.B. Westbroek, C.L. Geraedts, drs. A. Krijgsman, dr. A.A. Kaal, dr. A. Handelzalts, drs. K.L. Schaap, W. Maas, F.L. de Vries MSc, drs. H. Stouthart, drs. I. Pauw
<b>Teaching method(s)</b>	Study Group, Lecture
<b>Level</b>	400

## Didactiek 3

<b>Course code</b>	O_MLDIDAC_3 ()
<b>Period</b>	Period 4+5+6
<b>Credits</b>	9.0
<b>Language of tuition</b>	Dutch
<b>Faculty</b>	Fac. der Gedrags- en Bewegingswetensch.
<b>Coordinator</b>	drs. K.L. Schaap
<b>Examinator</b>	drs. K.L. Schaap
<b>Teaching staff</b>	drs. J.K.W. Riksen, drs. H.R. Goudsmit, drs. Y.G. Meindersma, ir. E.J.F. Scheringa, drs. W.S. Hoekstra, drs. C.D.P. van Oeveren, drs. S. Donszelmann, drs. B. Klein, drs. W. Jongejan, drs. L.J. van Well-van Grootheest, dr. H.B. Westbroek, C.L. Geraedts, drs. A. Krijgsman, dr. A.A. Kaal, dr. A. Handelzalts, drs. K.L. Schaap, W. Maas, F.L. de Vries MSc, drs. H. Stouthart, drs. I. Pauw
<b>Teaching method(s)</b>	Lecture, Study Group
<b>Level</b>	400

## Drug Action

<b>Course code</b>	X_432724 ()
<b>Period</b>	Period 3
<b>Credits</b>	6.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. H.F. Vischer

<b>Examinator</b>	dr. H.F. Vischer
<b>Teaching staff</b>	dr. H.F. Vischer
<b>Teaching method(s)</b>	Lecture
<b>Level</b>	400

### Course objective

To obtain a general introduction into and deepening of knowledge of fundamental principles and molecular aspects of drug action within the field of molecular pharmacology and receptor biochemistry.

### Course content

Most drugs display their pharmacological actions following the interactions with receptor proteins. As for the molecular pharmacological aspects the mechanisms by which these drugs act with respect to their therapeutic application will be studied. Novel concepts of pharmacology, including constitutive receptor activity, allosteric modulation, receptor dimerization and ligand-biased signaling will be addressed. Important cellular and animal model systems used to investigate (pathological and pharmacological) aspects of cell biology in relation to drug discovery will be discussed.

### Form of tuition

Lectures, exercises, case-studies

### Type of assessment

Written examination(s) and assignments.

### Course reading

Pharmacology in Drug Discovery - T.P. Kenakin  
ISBN 978-0-12-384856-7

Scientific papers (primary and review) provided during the course

### Recommended background knowledge

Knowledge of basic principles of drug action and mathematics (i.e. re-arranging formulas and understanding of (non)linear equations).

### Target group

mDDS

## Drug-induced Stress and Cellular Responses

<b>Course code</b>	X_432536 (432536)
<b>Period</b>	Period 2
<b>Credits</b>	6.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. J.N.M. Commandeur
<b>Examinator</b>	dr. J.N.M. Commandeur
<b>Teaching staff</b>	dr. J.N.M. Commandeur
<b>Teaching method(s)</b>	Lecture
<b>Level</b>	500

### Course objective

At the end of this theoretical course, the students are aware of the latest insights of cellular stress responses which can occur after exposure of cells to reactive drugs and/or reactive drug metabolites.

### Course content

Exposure of tissues to high levels of drugs and/or drug metabolites in some cases can trigger various biochemical responses. Interaction with sensor proteins can lead to adaptative stress responses which will protect the cell against further damage. If these adaptative stress responses are insufficient, interaction with critical proteins may lead to cell death or exaggerated, fatal pharmacological responses.

The following aspects will be studied in the course drug-induced stress and cellular signaling:

- (types of) adverse drug reactions
- role of biotransformation and drug transport in adverse drug reactions,
- reversible and irreversible interactions of toxic drugs with biological macromolecules,
- cellular adaptation to exposure to reactive intermediates and reactive oxygen species;
- cellular and molecular mechanisms leading to toxic effects,
- genetic toxicology and chemical carcinogenesis,
- role of mitochondria in necrosis and apoptosis,
- impairment of cell proliferation and tissue repair,
- immune-mediated toxicity.

### Form of tuition

Lectures and self study.

### Type of assessment

Written exam

### Course reading

Boelsterli, Mechanistic Toxicology: The Molecular Basis of How Chemicals Disrupt Biological Targets 2nd ed, CRC Press, 2007 (ISBN 0849372720).

### Entry requirements

Bachelor Physics, Chemistry, Mathematics, Biology, Medical Biology  
Pharmaceutical Sciences, Medical Natural Science Biomolecular Science  
portal course, or equivalent

### Target group

mDDS, mBMS

## Educational and Pedagogical Studies I

<b>Course code</b>	O_MLADEPI ()
<b>Period</b>	Period 1+2
<b>Credits</b>	6.0
<b>Language of tuition</b>	Dutch
<b>Faculty</b>	Fac. der Gedrags- en Bewegingswetensch.
<b>Coordinator</b>	dr. A. Handelzalts
<b>Examinator</b>	dr. A. Handelzalts

<b>Teaching staff</b>	drs. J.K.W. Riksen, drs. H.R. Goudsmit, drs. Y.G. Meindersma, drs. W.S. Hoekstra, drs. C.D.P. van Oeveren, drs. S. Donszelmann, drs. B. Klein, drs. W. Jongejan, dr. H.B. Westbroek, C.L. Geraedts, drs. A. Krijgsman, dr. A.A. Kaal, drs. K.L. Schaap, W. Maas, F.L. de Vries MSc, drs. H. Stouthart, drs. I. Pauw
<b>Teaching method(s)</b>	Lecture
<b>Level</b>	500

## Educational and Pedagogical Studies II

<b>Course code</b>	O_MLADEPII ()
<b>Period</b>	Period 1+2
<b>Credits</b>	3.0
<b>Faculty</b>	Fac. der Gedrags- en Bewegingswetensch.
<b>Coordinator</b>	dr. A. Handelzalts
<b>Examinator</b>	dr. A. Handelzalts
<b>Teaching staff</b>	drs. J.K.W. Riksen, drs. H.R. Goudsmit, drs. Y.G. Meindersma, drs. W.S. Hoekstra, drs. C.D.P. van Oeveren, drs. S. Donszelmann, drs. B. Klein, dr. T. Bosma, dr. H.B. Westbroek, C.L. Geraedts, drs. A. Krijgsman, dr. A.A. Kaal, drs. K.L. Schaap, W. Maas, F.L. de Vries MSc, drs. H. Stouthart, drs. I. Pauw
<b>Teaching method(s)</b>	Lecture, Seminar
<b>Level</b>	500

## Entrepreneurship in Health and Life Sc.

<b>Course code</b>	AM_470575 ()
<b>Period</b>	Period 2
<b>Credits</b>	6.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Fac. der Aard- en Levenswetenschappen
<b>Coordinator</b>	prof. dr. E. Masurel
<b>Examinator</b>	prof. dr. E. Masurel
<b>Teaching staff</b>	prof. dr. E. Masurel
<b>Teaching method(s)</b>	Lecture, Study Group
<b>Level</b>	500

### Course objective

Students obtain knowledge about and insight in the relevance of entrepreneurship and innovation for their own discipline. Students learn about the processes which are involved in the recognition and exploitation of opportunities, about creating economic and social value and about the nature and role of networks. In addition students gain knowledge of different entrepreneurial processes and the importance of valorisation of (bio)medical findings and business ideas for a knowledge-based economy.

### Learning objectives



- Become familiar with an innovation outlook on entrepreneurship.
- Become aware that value-adding opportunities not only contain financial aspects but also social and ecological aspects (sustainable entrepreneurship).
- Gain the ability to write a feasibility plan on how to bring an innovation to the market.
- Obtain knowledge about and insight in the relevance of entrepreneurship and innovation for science disciplines.
- Learn about the processes which are involved in the recognition and exploitation of opportunities, about creating economic and social value and about the nature and role of networks.
- Gain knowledge of different entrepreneurial processes and the importance of valorisation of (bio)medical findings and business ideas for a knowledge-based economy.

### **Course content**

This course consists of two tracks: a theoretical track and a practical track. These two tracks run simultaneously. In the first track you learn about entrepreneurship. Answers are found on questions such as: What is entrepreneurship? What defines an entrepreneur? What are entrepreneurial opportunities? What is the role of innovation in entrepreneurship? What is corporate social responsibility (CSR)? How can we judge the feasibility of entrepreneurial ambitions? Simultaneously you work on an assignment (second track). In the first week of this course you search for an innovation in your own discipline (product, service, process etc). Your choice must be approved by the lecturers. The first part of the assignment consists of a description of the innovation which you have chosen. Subsequently, you make a SWOT-analysis and a network analysis of the innovation. Also a paragraph on CSR aspect should be added. The final part of the assignment is your own feasibility study: how would you valorize the innovation to the market?

### **Form of tuition**

Lectures, personal meetings. Each week scientific lectures are given (on entrepreneurship, SWOT-analysis, innovation, CSR etc). These lectures are both the basis for the exam and for the assignment. Each week the student has a short meeting with his / her supervisor, in order to discuss the progress of his/her assignment.

### **Schedule and study time**

The total study time is 160 hours.

Tuition methods include lectures, consultancies and self-study.

The different elements have the following study time:

- lectures 18 hours
- consultancies 8 hours
- writing feasibility plan 65 hours
- examination 4 hours
- self study remaining hours

### **Type of assessment**

You conduct a written exam and an assignment. Both the exam and the assignment determine 50% of the grade. The exam and the assignment must be of sufficient quality.

### **Course reading**

To be announced on Blackboard

**Target group**

Optional course for Master students Management, Policy Analysis and Entrepreneurship in Health and Life sciences (MPA), M-differentiation of the Health, Life & Natural Sciences, Biology, Biomedical Sciences.

**Remarks**

Attendance is compulsory. Prior knowledge: Business Management in Health and Life sciences.

**Epidemiology**

<b>Course code</b>	AM_1179 ()
<b>Period</b>	Period 3
<b>Credits</b>	3.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Fac. der Aard- en Levenswetenschappen
<b>Coordinator</b>	dr. R.M.H. Peters
<b>Examinator</b>	dr. R.M.H. Peters
<b>Teaching method(s)</b>	Lecture, Study Group, Computer lab
<b>Level</b>	500

**Course objective**

- To gain an understanding of the principles of different study designs
- To gain an understanding of issues concerning measures of disease and association
- To gain an understanding of principles of bias and confounding
- To gain an understanding of the principles of screening and critically appraise its use in public health
- To learn how to calculate and interpret sensitivity, specificity, positive and negative predictive values
- To acquire skills to perform statistical analyses using a database (during the computer-based sessions) and interpret, describe and present the results critically

**Course content**

This two week course will help you to obtain an understanding of the principles of study designs (cross-sectional, longitudinal, case-control, clinical trials). Issues concerning exposure and disease measurement and exposure-disease relationships will be discussed in detail, and examples will be provided. Together with your colleagues, you will learn how to apply this knowledge first by hand (during the lectures), then to an epidemiologic database (during the computer-based sessions) and how to interpret the results critically.

**Form of tuition**

- Lectures (12 hours)
- Work groups (12 hours)
- Computer practicum (12 hours)
- Self-study (remaining time)

**Type of assessment**

- Exam
- Assignment

Both elements need to be passed.

**Course reading**

To be announced

**Target group**

Students without a background in epidemiology

**Registration procedure**

n/a

**Remarks**

Maximum 25 students

For more information contact Ruth Peters ([r.m.h.peters@vu.nl](mailto:r.m.h.peters@vu.nl))

**Ethics and Academic skills**

<b>Course code</b>	X_432725 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	1.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. J.E. van Muijlwijk-Koezen
<b>Examinator</b>	dr. J.E. van Muijlwijk-Koezen
<b>Level</b>	400

**Course objective**

In order to plan this course please contact your mastercoordinator for details

**Ethics and Academic skills**

<b>Course code</b>	X_432726 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	2.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. J.E. van Muijlwijk-Koezen
<b>Examinator</b>	dr. J.E. van Muijlwijk-Koezen
<b>Level</b>	400

**Course objective**

In order to plan this course please contact your mastercoordinator for details

**Ethics and Academic Skills**

<b>Course code</b>	X_437556 (437556)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	6.0
<b>Language of tuition</b>	English

<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. J.E. van Muijlwijk-Koezen
<b>Examinator</b>	dr. J.E. van Muijlwijk-Koezen
<b>Level</b>	400

### Course objective

In order to plan this course please contact your mastercoordinator for details

## Ethics and Academic Skills

<b>Course code</b>	X_432517 (432517)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	3.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. J.E. van Muijlwijk-Koezen
<b>Examinator</b>	dr. J.E. van Muijlwijk-Koezen
<b>Level</b>	400

### Course objective

In order to plan this course please contact your mastercoordinator for details

### Course content

Period: Variable

## Ethics in Life Sciences

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

### Course objective

To provide a toolbox of ethical instruments to analyze properly moral problems related (to one's own) research in the life sciences

- To acquire conceptual knowledge of the central concepts in applied philosophy and professional ethics
- To challenge an ethical reflection on one owns life science specialization and to open it for an impartial and constructive discussion
- To exercise a team based project to enter prepare and execute a moral dialogue

- To acquire the necessary skills to handle ethical issues in an accountable manner, as a professional academic beyond one's own inclinations and prejudgments

### Course content

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

### Form of tuition

Ethics in the Life Sciences is a fulltime course of four weeks (3 ECTS).

The total study time is 80 hours.

The different elements have the following study time:

- Lectures: 13 hours
- Work groups: 17 hours
- Group assignment: 24 hours
- Exam: 2 hour
- Presentation : 4 hours
- Self working (reading in the first week ): 20 hours

Please note that attendance to the work group meetings is compulsory.

Attendance to the lectures is highly recommended. In our experience, relying on self-study alone is insufficient to apply the theory of the lectures in the assignments of the workgroups, and to pass the exam.

### Type of assessment

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

### Course reading

Available on Blackboard

### Entry requirements

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

### Target group

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

### Remarks

Lectures in English, part of the workgroups are in Dutch. All presentations and plenary discussions in English.

In order to maximize the experience of differences in values and preferences, and this increase meaningful ethical inquiry we will place you randomly in the workgroups. Placement will be communicated after the introduction lecture.

## High-Throughput Screening

<b>Course code</b>	X_435047 (435047)
<b>Period</b>	Period 2

<b>Credits</b>	6.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. J. Kool
<b>Examinator</b>	dr. J. Kool
<b>Teaching staff</b>	dr. J. Kool
<b>Teaching method(s)</b>	Lecture
<b>Level</b>	500

### **Course objective**

In depth study on the bio-analytical and screening aspects related to target and lead discovery of drugs.

### **Course content**

During this course the potential of modern analytical and biological screening techniques used in target, hit and lead discovery will be discussed. The emphasis will be on the treatment of advanced sample preparation techniques (i.e. automation, high-throughput / combinatorial chemistry, miniaturization), biological and immunological high throughput screening assays and advanced separation methods. Also, the so called "Omics" will be discussed (e.g. proteomics and metabolomics). These techniques will be discussed in relation with pharmacokinetic studies and the applicability of the various techniques within the various stages of target discovery, hit screening, ADME(tox), and early lead discovery. Finally, miniaturization approaches will be dealt with.

### **Form of tuition**

The course starts with a thorough explanation on all subjects that will be discussed, and during which lecture. During the lectures, relevant literature per lecture will be mentioned. This literature is mainly from e-books (chapters) and from academic papers/reviews. All literature that will be mentioned can be found in the course documents on BlackBoard. All this literature has to be studied for the oral examination. All students will work on an assignment related to a topic in high throughput screening. This assignment results in a document and a PowerPoint presentation of 8 minutes.

### **Type of assessment**

Examination is in the form of an oral or written examination accounting for 50% of the final mark (depending on the number of students entering the course). All lectures and all literature provided are included in the examination. All material to be studied and learned for the examination can be accessed during the examination. Students can take all printed material and/or a computer with them during the examination. De presentation of 8 minutes followed by questions and replies to these questions constitutes 25% of the final mark. The Document's topic and the presentation's topic are related to each other. The document is between 6 and 8 pages (Times New Roman type 12; line spacing 1) including title page and with a maximum of 4 Figures/Tables. The assignment document constitutes the other 25% of the final mark. The marks of the examination, the presentation and discussion afterwards, and the assignment document all have to be sufficient (6.0). (If more than 12 students join this course, students will form groups of two students. In that case, the presentations will be given by both students per group and each presentation has a duration of 12 minutes. The document is then between 10 and 14 pages (Times New Roman type 12;

line spacing 1) including title page and with a maximum of 6 Figures/Tables. The oral examination will then still be on individual basis).

### Course reading

Please see the Course Documents on BlackBoard. The PowerPoint presentation named "HTS Course Overview" gives a detailed explanation/overview of the lectures, tutorials and course structure. All PowerPoint lectures will be placed on BlackBoard at least one day before each lecture. All PDF e-book chapters and other literature (e.g. academic research papers and reviews) can already be found on BlackBoard. It will be announced when each PDF literature is/are to be read in order to prepare for a respective lecture.

### Recommended background knowledge

Basic knowledge of biochemistry, separation sciences, spectroscopy and mass spectrometry.

### Target group

mCh-AS, mCh-MDSC, mDDS-BCCA, mDDS-DDTF

## Internship abroad DDS Biomol. Drug Analysis

<b>Course code</b>	X_432674 (432674)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	18.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. H. Lingeman
<b>Examinator</b>	dr. H. Lingeman
<b>Level</b>	500

### Course objective

To acquire knowledge and insight into the role and objective of drug, bio-analytical and clinical development processes in industry and research institutes.

### Course content

This project aims to provide students with a theoretical and practical understanding of the issues involved in the design, conduct, analyses and interpretation of analytical studies.

### Target group

mDDS

### Remarks

For further information please contact Henk Lingeman.

## Internship abroad DDS Biomol. Drug Analysis

<b>Course code</b>	X_432753 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	24.0
<b>Language of tuition</b>	English

<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. H. Lingeman
<b>Examinator</b>	dr. H. Lingeman
<b>Level</b>	500

### Course objective

To acquire knowledge and insight into the role and objective of drug, bio-analytical and clinical development processes in industry, and research institutes.

### Course content

This project aims to provide student with a theoretical and practical understanding of the issues involved in the design, conduct, analyses and interpretation of analytical studies.

### Target group

mDDS

### Remarks

For further information please contact Henk Lingeman.

## Internship abroad DDS Biomol. Drug Analysis

<b>Course code</b>	X_432758 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	30.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. H. Lingeman
<b>Examinator</b>	dr. H. Lingeman
<b>Level</b>	500

### Course objective

To acquire knowledge and insight into the role and objective of drug, bio-analytical and clinical development processes in industry and research institutes.

### Course content

This project aims to provide students with a theoretical and practical understanding of the issues involved in the design, conduct, analyses and interpretation of analytical studies.

### Target group

mDDS

### Remarks

For further information please contact Henk Lingeman.

## Internship abroad DDS Biomol. Drug Analysis

<b>Course code</b>	X_432837 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	36.0



<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. H. Lingeman
<b>Examinator</b>	dr. H. Lingeman
<b>Level</b>	500

#### Course objective

To acquire knowledge and insight into the role and objective of drug, bioanalytical and clinical development processes.

#### Course content

This project aims to provide student with a theoretical and practical understanding of the issues involved in the design, conduct, analysis and interpretation of analytical studies.

#### Target group

mDDS

### Internship abroad DDS Comp. Med. Chem. & Tox.

<b>Course code</b>	X_432675 (432675)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	18.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. D.P. Geerke
<b>Examinator</b>	dr. D.P. Geerke
<b>Level</b>	500

#### Course objective

To obtain experience in doing scientific research in another country.

#### Course content

During a traineeship, the student actively participates in a research project within a university or company in another country.

#### Type of assessment

Report, presentation and practical work.

#### Target group

mDDS

#### Remarks

Please contact the coordinator well in advance to check for possibilities and to discuss the most suitable duration of the traineeship.

### Internship abroad DDS Comp. Med. Chem. & Tox.

<b>Course code</b>	X_432754 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	24.0

<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. D.P. Geerke
<b>Examinator</b>	dr. D.P. Geerke
<b>Level</b>	500

#### Course objective

To obtain experience in doing scientific research in another country.

#### Course content

During a traineeship, the student actively participates in a research project within a university or company in another country.

#### Type of assessment

Report, presentation and practical work.

#### Target group

mDDS

#### Remarks

Please contact the coordinator well in advance to check for possibilities and to discuss the most suitable duration of the traineeship.

### Internship abroad DDS Comp. Med. Chem. & Tox.

<b>Course code</b>	X_432759 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	30.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. D.P. Geerke
<b>Examinator</b>	dr. D.P. Geerke
<b>Level</b>	500

#### Course objective

To obtain experience in doing scientific research in another country.

#### Course content

During a traineeship, the student actively participates in a research project within a university or company in another country.

#### Type of assessment

Report, presentation and practical work.

#### Target group

mDDS

#### Remarks

Please contact the coordinator well in advance to check for possibilities and to discuss the most suitable duration of the traineeship.

### Internship abroad DDS Comp. Med. Chem. & Tox.

<b>Course code</b>	X_432838 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	36.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. D.P. Geerke
<b>Examinator</b>	dr. D.P. Geerke
<b>Level</b>	500

## Internship abroad DDS Drug Design & Synth.

<b>Course code</b>	X_432676 (432676)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	18.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. M. Wijtmans
<b>Examinator</b>	dr. M. Wijtmans
<b>Level</b>	500

### Course objective

To obtain experience in doing scientific research in another country.

### Course content

During a traineeship, the student actively participates in a research project within a university or company in another country.

### Type of assessment

Report, presentation and practical work.

### Target group

mDDS

### Registration procedure

Please contact the coordinator well in advance to check for possibilities and to discuss the most suitable duration of the traineeship.

## Internship abroad DDS Drug Design & Synth.

<b>Course code</b>	X_432755 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	24.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. M. Wijtmans
<b>Examinator</b>	dr. M. Wijtmans
<b>Level</b>	500

**Course objective**

To obtain experience in doing scientific research in another country.

**Course content**

During a traineeship, the student actively participates in a research project within a university or company in another country.

**Type of assessment**

Report, presentation and practical work.

**Target group**

mDDS

**Registration procedure**

Please contact the coordinator well in advance to check for possibilities and to discuss the most suitable duration of the traineeship.

**Internship abroad DDS Drug Design & Synth.**

<b>Course code</b>	X_432760 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	30.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. M. Wijtman
<b>Examinator</b>	dr. M. Wijtman
<b>Level</b>	500

**Course objective**

To obtain experience in doing scientific research in another country.

**Course content**

During a traineeship, the student actively participates in a research project within a university or company in another country.

**Type of assessment**

Report, presentation and practical work.

**Target group**

mDDS

**Registration procedure**

Please contact the coordinator well in advance to check for possibilities and to discuss the most suitable duration of the traineeship.

**Internship abroad DDS Drug Design & Synth.**

<b>Course code</b>	X_432839 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	36.0

<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. M. Wijtmans
<b>Examinator</b>	dr. M. Wijtmans
<b>Level</b>	500

#### **Course objective**

To obtain experience in doing scientific research in another country.

#### **Course content**

During a traineeship, the student actively participates in a research project within a university or company in another country.

#### **Type of assessment**

Report, presentation and practical work.

#### **Target group**

mDDS

#### **Registration procedure**

Please contact the coordinator well in advance to check for possibilities and to discuss the most suitable duration of the traineeship.

### Internship abroad DDS Drug Disc. & Target Find.

<b>Course code</b>	X_432678 (432678)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	18.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. M.H. Siderius
<b>Examinator</b>	dr. M.H. Siderius
<b>Level</b>	500

#### **Course objective**

To obtain experience in scientific research abroad.

#### **Course content**

During an internship the student actively participates in a research project within an institute or a company abroad.

#### **Type of assessment**

Practical work, report and presentation.

#### **Target group**

mDDS

#### **Remarks**

Please contact the coordinator well in advance.

### Internship abroad DDS Drug Disc. & Target Find.

<b>Course code</b>	X_432757 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	24.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. M.H. Siderius
<b>Examinator</b>	dr. M.H. Siderius
<b>Level</b>	500

#### **Course objective**

To obtain experience in scientific research abroad.

#### **Course content**

During an internship the student actively participates in a research project within an institute or a company abroad.

#### **Type of assessment**

Practical work, report and presentation.

#### **Target group**

mDDS

#### **Remarks**

Please contact the coordinator well in advance.

### Internship abroad DDS Drug Disc. & Target Find.

<b>Course code</b>	X_432762 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	30.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. M.H. Siderius
<b>Examinator</b>	dr. M.H. Siderius
<b>Level</b>	500

#### **Course objective**

To obtain experience in scientific research abroad.

#### **Course content**

During an internship the student actively participates in a research project within an institute or a company abroad.

#### **Type of assessment**

Practical work, report and presentation.

#### **Target group**

mDDS

#### **Remarks**

Please contact the coordinator well in advance.

### Internship abroad DDS Drug Disc. & Target Find.

<b>Course code</b>	X_432840 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	36.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. M.H. Siderius
<b>Examinator</b>	dr. M.H. Siderius
<b>Level</b>	500

## Internship abroad DDS Drug, Disp. and Saf. Assessm.

<b>Course code</b>	X_432677 (432677)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	18.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. J.N.M. Commandeur
<b>Examinator</b>	dr. J.N.M. Commandeur
<b>Level</b>	500

### Course objective

To perform research in the area of molecular and biochemical toxicology and to get familiar with experimental approaches used in this field. To define a hypothesis based on previous observations or publications, and to design, execute and critically interpret the experiments performed to test specific hypotheses.

### Course content

The research project will be carried out in a research group which is active in the area of molecular and biochemical toxicology. Generally, research can focussed on the role of drug transporters and drug metabolising enzymes in the bioactivation and bioinactivation of toxic drugs and other chemicals, identification of genetically determined enzymes, drug-drug interactions, the identification of reactive intermediates and cellular targets of reactive intermediates, cellular responses related to cytotoxicity or adaptation reactions, mechanisms of genotoxicity (mutagenicity, carcinogenicity), idiosyncratic drug reactions, identification of biomarkers for early and late toxic effects, etc.

### Form of tuition

Experimental research project, starting with a brief literature survey on the topic to be investigated.

### Type of assessment

Written report, (participation to) work discussions, and oral presentation in the section of Molecular Toxicology.

### Course reading

Relevant reviews will be provided at the start of the project.

**Recommended background knowledge**

Courses ADMET, Drug-induced stress and cellular signalling or equivalent courses.

**Target group**

mDDS-DDSA

**Remarks**

Students who want to perform an internship abroad should first ask for approval at the exam committee by sending a short description of the research project and a declaration of the mastercoordinator (dr JNM Commandeur; [j.n.m.commandeur@vu.nl](mailto:j.n.m.commandeur@vu.nl)) in which the procedure on how the quality and progress of the research project will be monitored and how the final assessment of the project will be organized (usually based on the experimental performance, a written report and final oral presentation).

Lecturers:

dr. J.N.M. Commandeur

dr. J.C. Vos

**Internship abroad DDS Drug, Disp. and Saf. Assessm.**

<b>Course code</b>	X_432756 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	24.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. J.N.M. Commandeur
<b>Examinator</b>	dr. J.N.M. Commandeur
<b>Level</b>	500

**Course objective**

To perform research in the area of molecular and biochemical toxicology and to get familiar with experimental approaches used in this field.

To define a hypothesis based on previous observations or publications, and to design, execute and critically interpret the experiments performed to test specific hypotheses.

**Course content**

The research project will be carried out in a research group which is active in the area of molecular and biochemical toxicology.

Generally, research can be focused on the role of drug transporters and drug metabolising enzymes in the bioactivation and bioinactivation of toxic drugs and other chemicals, identification of genetically determined enzymes, drug-drug interactions, the identification of reactive intermediates and cellular targets of reactive intermediates, cellular responses related to cytotoxicity or adaptation reactions, mechanisms of genotoxicity (mutagenicity, carcinogenicity), idiosyncratic drug reactions, identification of biomarkers for early and late toxic effects, etc.



**Form of tuition**

Experimental research project, starting with a brief literature survey on the topic to be investigated.

**Type of assessment**

Written report, (participation to) work discussions, and oral presentation.

**Course reading**

Relevant reviews will be provided at the start of the project.

**Recommended background knowledge**

Courses ADMET, Drug-induced stress and cellular signalling, Advanced Course on Drug Disposition and Safety Assessment, or equivalent courses.

**Target group**

mDDS-DDSA

**Remarks**

Students who want to perform an internship abroad should first ask for approval at the exam committee by sending a short description of the research project and a declaration of the mastercoordinator (dr JNM Commandeur; [j.n.m.commandeur@vu.nl](mailto:j.n.m.commandeur@vu.nl)) in which the procedure is described on how the quality and progress of the research project will be monitored and how the final assessment of the project will be organized (usually based on the experimental performance, a written report and final oral presentation).

Lecturers:

dr. J.N.M. Commandeur

dr. J.C. Vos

**Internship abroad DDS Drug, Disp. and Saf. Assessm.**

<b>Course code</b>	X_432761 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	30.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. J.N.M. Commandeur
<b>Examinator</b>	dr. J.N.M. Commandeur
<b>Level</b>	500

**Course objective**

To perform research in the area of molecular and biochemical toxicology and to get familiar with experimental approaches used in this field.

To define a hypothesis based on previous observations or publications, and to design, execute and critically interpret the experiments performed to test specific hypotheses.

**Course content**

The research project will be carried out in a research group which is active in the area of molecular and biochemical toxicology. Generally, research can be focussed on the role of drug transporters and drug metabolising enzymes in the bioactivation and bioinactivation of toxic drugs and other chemicals, identification of genetically determined enzymes, drug-drug interactions, the identification of reactive intermediates and cellular targets of reactive intermediates, cellular responses related to cytotoxicity or adaptation reactions, mechanisms of genotoxicity (mutagenicity, carcinogenicity), idiosyncratic drug reactions, identification of biomarkers for early and late toxic effects, etc.

#### **Form of tuition**

Experimental research project, starting with a brief literature survey on the topic to be investigated.

#### **Type of assessment**

Written report, (participation to) work discussions, and oral presentation.

#### **Course reading**

Relevant reviews will be provided at the start of the project.

#### **Recommended background knowledge**

Courses ADMET, Drug-induced stress and cellular signalling, Advanced Course on Drug Disposition and Safety Assessment, or equivalent courses.

#### **Target group**

mDDS-DDSA

#### **Remarks**

Students who want to perform an internship abroad should first ask for approval at the exam committee by sending a short description of the research project and a declaration of the mastercoordinator (dr JNM Commandeur; [j.n.m.commandeur@vu.nl](mailto:j.n.m.commandeur@vu.nl)) in which the procedure is described on how the quality and progress of the research project will be monitored and how the final assessment of the project will be organized (usually based on the experimental performance, a written report and final oral presentation).

Lecturers:

dr. J.N.M. Commandeur

dr. J.C. Vos

### **Internship abroad DDS Drug, Disp. and Saf. Assessm.**

<b>Course code</b>	X_432841 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	36.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. J.N.M. Commandeur
<b>Examinator</b>	dr. J.N.M. Commandeur
<b>Level</b>	500

### Course objective

To perform research in the area of molecular and biochemical toxicology and to get familiar with experimental approaches used in this field.

To define a hypothesis based on previous observations or publications, and to design, execute and critically interpret the experiments performed to test specific hypotheses.

### Course content

The research project will be carried out in a research group which is active in the area of molecular and biochemical toxicology.

Generally, research can be focussed on the role of drug transporters and drug metabolising enzymes in the bioactivation and bioinactivation of toxic drugs and other chemicals, identification of genetically determined enzymes, drug-drug interactions, the identification of reactive intermediates and cellular targets of reactive intermediates, cellular responses related to cytotoxicity or adaptation reactions, mechanisms of genotoxicity (mutagenicity, carcinogenicity), idiosyncratic drug reactions, identification of biomarkers for early and late toxic effects, etc.

### Form of tuition

Experimental research project, starting with a brief literature survey on the topic to be investigated.

### Type of assessment

Written report, (participation to) work discussions, and oral presentation.

### Course reading

Relevant reviews will be provided at the start of the project.

### Recommended background knowledge

Courses ADMET, Drug-induced stress and cellular signalling, Advanced Course on Drug Disposition and Safety Assessment, or equivalent courses.

### Target group

mDDS-DDSA

### Remarks

Students who want to perform an internship abroad should first ask for approval at the exam committee by sending a short description of the research project and a declaration of the mastercoordinator (dr JNM Commandeur; [j.n.m.commandeur@vu.nl](mailto:j.n.m.commandeur@vu.nl)) in which the procedure is described on how the quality and progress of the research project will be monitored and how the final assessment of the project will be organized (usually based on the experimental performance, a written report and final oral presentation).

Lecturers:

dr. J.N.M. Commandeur

dr. J.C. Vos

## Internship Societal Specialisation

Course code	AM_471147 ()
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<b>Period</b>	Ac. Year (September)
<b>Credits</b>	30.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Fac. der Aard- en Levenswetenschappen
<b>Coordinator</b>	dr. R.J. van Belle-van den Berg
<b>Examinator</b>	dr. R.J. van Belle-van den Berg
<b>Level</b>	600

## Literature thesis and Colloquium

<b>Course code</b>	X_432577 (432577)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	12.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. H. Lingeman
<b>Examinator</b>	dr. H. Lingeman
<b>Level</b>	600

### Course objective

Literature study on a topic related to biomolecular analysis.

### Course content

The topic will be chosen in close cooperation and with approval of the master coordinator.

### Form of tuition

Selfstudy and discussion sessions.

### Type of assessment

Report and presentation.

### Target group

mDDS

### Remarks

Please contact the coördinator.

## Literature thesis and Colloquium DDS Medical Chemistry, DD&S

<b>Course code</b>	X_432573 (432573)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	12.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. M. Wijtmans
<b>Examinator</b>	dr. M. Wijtmans
<b>Level</b>	600

**Course objective**

To be able to efficiently retrieve in-depth information about a given scientific topic, logically categorize and describe the information in a thesis, and present the main findings in a colloquium.

**Course content**

Completion of an academic MSc degree does not only imply practical experience and knowledge from the scientific specialisation, it also implies that one is able to deal with substantial amounts of scientific information in an efficient way and distill this into the main points. During the literature thesis, the student will collect recent in-depth scientific literature about a given Medicinal Chemistry research topic, usually a topic of direct interest to the research group. The literature information is described in a coherent form in a thesis, which is also presented orally during a colloquium.

**Form of tuition**

Self-study, contact hours with supervisor.

**Type of assessment**

Thesis, colloquium.

**Course reading**

A guide with general hints and tips on writing a thesis will be provided.

**Target group**

mDDS-DD&S

**Registration procedure**

Please contact the coordinator in advance for a discussion and planning of the topic.

## Literature thesis and Colloquium DDS Molecular Toxicology, DDSA

<b>Course code</b>	X_432575 (432575)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	12.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. J.N.M. Commandeur
<b>Examinator</b>	dr. J.N.M. Commandeur
<b>Level</b>	600

**Course objective**

To demonstrate that the student is able to collect relevant and recent primary scientific literature on a predefined subject in the area of molecular and biochemical toxicology, to organize the information in chapters and to draw conclusions on the perspectives or relevance of the subject.

**Course content**

The content of the literature thesis/colloquium depends on the subject which will be selected in consultation with master coordinator dr. JNM

Commandeur ([j.n.m.commandeur@vu.nl](mailto:j.n.m.commandeur@vu.nl)).

### Form of tuition

Literature study

### Type of assessment

Written literature thesis and oral presentation (colloquium) for the department of Pharmaceutical Sciences.

### Recommended background knowledge

The courses ADMET and Drug-induced stress and cellular responses or equivalent courses.

### Target group

mDDS-DDSA

### Remarks

A list of subjects for the literature thesis and colloquium can be obtained from dr. JNM Commandeur ([j.n.m.commandeur@vu.nl](mailto:j.n.m.commandeur@vu.nl))

Lecturers:

dr. J.N.M. Commandeur

dr. J.C. Vos.

## Major Research Project Biomol. Drug Analysis

<b>Course code</b>	X_432564 (432564)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	42.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. H. Lingeman
<b>Examinator</b>	dr. H. Lingeman
<b>Level</b>	600

### Course objective

To acquire knowledge and insight into the role and objective of drug, bioanalytical and clinical development processes in complex samples using LC-MS and bio-assay-MS based approaches.

### Course content

This project aims to provide the student with a theoretical and practical understanding of the issues involved in the design, conduct, analyses and interpretation of complex analytical studies.

### Target group

mDDS-BDA

### Remarks

For further information please contact Henk Lingeman.

## Major Research Project Biomol. Drug Analysis

<b>Course code</b>	X_432567 (432567)
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<b>Period</b>	Ac. Year (September)
<b>Credits</b>	48.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. H. Lingeman
<b>Examinator</b>	dr. H. Lingeman
<b>Level</b>	600

### Course objective

To acquire knowledge and insight into the role and objective of drug, bio-analytical and clinical development processes in complex samples using LC-MS and bio-assay-MS based approaches.

### Course content

This project aims to provide the student with a theoretical and practical understanding of the issues involved in the design, conduct, analyses and interpretation of complex analytical studies.

### Target group

mDDS-BDA

### Remarks

For further information please contact Henk Lingeman.

## Major Research Project Biomol. Drug Analysis

<b>Course code</b>	X_432568 (432568)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	54.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. H. Lingeman
<b>Examinator</b>	dr. H. Lingeman
<b>Level</b>	600

### Course objective

To acquire knowledge and insight into the role and objective of drug, bio-analytical and clinical development processes in complex samples using LC-MS and bio-assay-MS based approaches.

### Course content

This project aims to provide the student with a theoretical and practical understanding of the issues involved in the design, conduct, analyses and interpretation of complex analytical studies.

### Target group

mDDS-BDA

### Remarks

For further information please contact Henk Lingeman.

## Major Research Project Biomol. Drug Analysis

<b>Course code</b>	X_432569 (432569)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	60.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. H. Lingeman
<b>Examinator</b>	dr. H. Lingeman
<b>Level</b>	600

### Course objective

To acquire knowledge and insight into the role and objective of drug, bio-analytical and clinical development processes in complex samples using LC-MS and bio-assay-MS based approaches.

### Course content

This project aims to provide the student with a theoretical and practical understanding of the issues involved in the design, conduct, analyses and interpretation of complex analytical studies.

### Target group

mDDS-BDA

### Remarks

For further information please contact Henk Lingeman.

## Major Research Project DDS Biomolecular Drug Analysis (C,E,M)

<b>Course code</b>	X_432727 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	24.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. H. Lingeman
<b>Examinator</b>	dr. H. Lingeman
<b>Level</b>	600

### Course objective

To acquire knowledge and insight into the role and objective of drug, bio-analytical and clinical development processes in complex samples using LC-MS and bio-assay-MS based approaches.

### Course content

This project aims to provide the student with a theoretical and practical understanding of the issues involved in the design, conduct, analyses and interpretation of complex analytical studies.

### Target group

mDDS-BDA

### Remarks

For further information please contact Henk Lingeman.

## Major Research Project DDS Medicinal Chemistry, DD&S



<b>Course code</b>	X_432728 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	24.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. M. Wijtman
<b>Examinator</b>	dr. M. Wijtman
<b>Level</b>	600

### Course objective

To obtain experience in design and/or synthesis techniques and in doing scientific research.

### Course content

Within medicinal chemistry research, computational chemistry and organic synthesis play a major role in designing and preparing small organic ligands as e.g. protein modulators. During the traineeship, the student actively participates in a research project at e.g. the VU Drug Design and Synthesis laboratories and as such contributes to new scientific results. The focus can be on organic synthesis, on drug design, or on both. Attention will be paid to setting up research experiments, using state-of-the-art experimental techniques, analyzing experimental results and keeping adequate documentation. In all, the student will get exposed to the joys of doing research as well as to exciting contemporary synthetic and/or design techniques.

The student will twice report on the research progress in an oral presentation. The traineeship is completed with a written report.

### Type of assessment

Presentation, report, practical work.

### Course reading

Will be provided by the supervisor. The first 1-2 weeks of the traineeship will be spent on literature reading.

### Entry requirements

Entry requirements with respect to courses likely apply. Ask the coordinator well in advance.

A traineeship cannot take place if the student has less than 18 EC of passed courses.

### Target group

mDDS-DD&S

### Registration procedure

Please contact the coordinator well in advance.

## Major Research Project DDS Medicinal Chemistry, DD&S

<b>Course code</b>	X_432509 (432509)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	42.0
<b>Language of tuition</b>	English

<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. M. Wijtmans
<b>Examinator</b>	dr. M. Wijtmans
<b>Level</b>	600

### Course objective

To obtain experience in design and/or synthesis techniques and in doing scientific research.

### Course content

Within medicinal chemistry research, computational chemistry and organic synthesis play a major role in designing and preparing small organic ligands as e.g. protein modulators. During the traineeship, the student actively participates in a research project at e.g. the VU Drug Design and Synthesis laboratories and as such contributes to new scientific results. The focus can be on organic synthesis, on drug design, or on both. Attention will be paid to setting up research experiments, using state-of-the-art experimental techniques, analyzing experimental results and keeping adequate documentation. In all, the student will get exposed to the joys of doing research as well as to exciting contemporary synthetic and/or design techniques.

The student will twice report on the research progress in an oral presentation. The traineeship is completed with a written report.

### Type of assessment

Presentation, report, practical work.

### Course reading

Will be provided by the supervisor. The first 1-2 weeks of the traineeship will be spent on literature reading.

### Entry requirements

Entry requirements with respect to courses likely apply. Ask the coordinator well in advance.

A traineeship cannot take place if the student has less than 18 EC of passed courses.

### Target group

mDDS-DD&S

### Registration procedure

Please contact the coordinator well in advance.

### Remarks

There are four variants of this traineeship. Extension of the traineeship up to 60 ECTS can be incorporated as part of the optional part of the MSc program.

X\_432509: 42 ECTS

X\_432544: 48 ECTS

X\_432545: 54 ECTS

X\_432546: 60 ECTS

## Major Research Project DDS Medicinal Chemistry, DD&S

<b>Course code</b>	X_432544 (432544)
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<b>Period</b>	Ac. Year (September)
<b>Credits</b>	48.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. M. Wijtman
<b>Examinator</b>	dr. M. Wijtman
<b>Level</b>	600

### Course objective

To obtain experience in design and/or synthesis techniques and in doing scientific research.

### Course content

Within medicinal chemistry research, computational chemistry and organic synthesis play a major role in designing and preparing small organic ligands as e.g. protein modulators. During the traineeship, the student actively participates in a research project at e.g. the VU Drug Design and Synthesis laboratories and as such contributes to new scientific results. The focus can be on organic synthesis, on drug design, or on both. Attention will be paid to setting up research experiments, using state-of-the-art experimental techniques, analyzing experimental results and keeping adequate documentation. In all, the student will get exposed to the joys of doing research as well as to exciting contemporary synthetic and/or design techniques.

The student will twice report on the research progress in an oral presentation. The traineeship is completed with a written report.

### Type of assessment

Presentation, report, practical work.

### Course reading

Will be provided by the supervisor. The first 1-2 weeks of the traineeship will be spent on literature reading.

### Entry requirements

Entry requirements with respect to courses likely apply. Ask the coordinator well in advance.

A traineeship cannot take place if the student has less than 18 EC of passed courses.

### Target group

mDDS-DD&S

### Registration procedure

Please contact the coordinator well in advance.

### Remarks

There are four variants of this traineeship. Extension of the traineeship up to 60 ECTS can be incorporated as part of the optional part of the MSc program.

X\_432509: 42 ECTS

X\_432544: 48 ECTS

X\_432545: 54 ECTS

X\_432546: 60 ECTS

## Major Research Project DDS Medicinal Chemistry, DD&S

<b>Course code</b>	X_432545 (432545)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	54.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. M. Wijtmans
<b>Examinator</b>	dr. M. Wijtmans
<b>Level</b>	600

### Course objective

To obtain experience in design and/or synthesis techniques and in doing scientific research.

### Course content

Within medicinal chemistry research, computational chemistry and organic synthesis play a major role in designing and preparing small organic ligands as e.g. protein modulators. During the traineeship, the student actively participates in a research project at e.g. the VU Drug Design and Synthesis laboratories and as such contributes to new scientific results. The focus can be on organic synthesis, on drug design, or on both. Attention will be paid to setting up research experiments, using state-of-the-art experimental techniques, analyzing experimental results and keeping adequate documentation. In all, the student will get exposed to the joys of doing research as well as to exciting contemporary synthetic and/or design techniques.

The student will twice report on the research progress in an oral presentation. The traineeship is completed with a written report.

### Type of assessment

Presentation, report, practical work.

### Course reading

Will be provided by the supervisor. The first 1-2 weeks of the traineeship will be spent on literature reading.

### Entry requirements

Entry requirements with respect to courses likely apply. Ask the coordinator well in advance.

A traineeship cannot take place if the student has less than 18 EC of passed courses.

### Target group

mDDS-DD&S

### Registration procedure

Please contact the coordinator well in advance.

### Remarks

There are four variants of this traineeship. Extension of the traineeship up to 60 ECTS can be incorporated as part of the optional part of the MSc program.

X\_432509: 42 ECTS  
X\_432544: 48 ECTS  
X\_432545: 54 ECTS  
X\_432546: 60 ECTS

## Major Research Project DDS Medicinal Chemistry, DD&S

<b>Course code</b>	X_432546 (432546)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	60.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. M. Wijtmans
<b>Examinator</b>	dr. M. Wijtmans
<b>Level</b>	600

### Course objective

To obtain experience in design and/or synthesis techniques and in doing scientific research.

### Course content

Within medicinal chemistry research, computational chemistry and organic synthesis play a major role in designing and preparing small organic ligands as e.g. protein modulators. During the traineeship, the student actively participates in a research project at e.g. the VU Drug Design and Synthesis laboratories and as such contributes to new scientific results. The focus can be on organic synthesis, on drug design, or on both. Attention will be paid to setting up research experiments, using state-of-the-art experimental techniques, analyzing experimental results and keeping adequate documentation. In all, the student will get exposed to the joys of doing research as well as to exciting contemporary synthetic and/or design techniques.

The student will twice report on the research progress in an oral presentation. The traineeship is completed with a written report.

### Type of assessment

Presentation, report, practical work.

### Course reading

Will be provided by the supervisor. The first 1-2 weeks of the traineeship will be spent on literature reading.

### Entry requirements

Entry requirements with respect to courses likely apply. Ask the coordinator well in advance.

A traineeship cannot take place if the student has less than 18 EC of passed courses.

### Target group

mDDS-DD&S

### Registration procedure

Please contact the coordinator well in advance.

### Remarks

There are four variants of this traineeship. Extension of the traineeship up to 60 ECTS can be incorporated as part of the optional part of the MSc program.

X\_432509: 42 ECTS

X\_432544: 48 ECTS

X\_432545: 54 ECTS

X\_432546: 60 ECTS

### Major Research Project DDS Medicinal Chemistry, DDTF

<b>Course code</b>	X_432729 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	24.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. M.H. Siderius
<b>Examinator</b>	dr. M.H. Siderius
<b>Level</b>	600

### Major Research Project DDS Molecular Toxicology, CMCT

<b>Course code</b>	X_432730 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	24.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. D.P. Geerke
<b>Examinator</b>	dr. D.P. Geerke
<b>Level</b>	600

### Major Research Project DDS Molecular Toxicology, DDSA

<b>Course code</b>	X_432559 (432559)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	42.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. J.N.M. Commandeur
<b>Examinator</b>	dr. J.N.M. Commandeur
<b>Level</b>	600

### Course objective

To perform research in the area of molecular and biochemical toxicology and to get familiar with experimental approaches used in this field.

To define a hypothesis based on previous observations or publications, and to design, execute and critically interpret the experiments

performed to test specific hypotheses.

### Course content

The research project will be carried out in the context in one of the PhD- or postdoc-projects which are carried out in the section Molecular Toxicology.

Generally, the research is focussed on the role of drug metabolising enzymes, such as cytochromes P450, glutathione transferases, sulfotransferases, etc. in the bioactivation and bioinactivation of toxic drugs and other chemicals, identification of genetically determined enzymes, drug-drug interactions, the identification of reactive intermediates and cellular targets of reactive intermediates and cellular responses related to cytotoxicity or adaptation reactions.

### Form of tuition

Experimental research project, starting with a brief literature survey on the topic to be investigated.

### Type of assessment

Written report, (participation to) work discussions, and oral presentation in the section of Molecular Toxicology.

### Course reading

Relevant reviews will be provided at the start of the project.

### Recommended background knowledge

Courses ADMET, Drug-induced stress and cellular signalling or equivalent courses.

### Target group

mDDS-DDSA

### Remarks

Registration for a research project should be ultimately 4 weeks in advance. General information on projects to which the student can participate will be provided by master coordinator dr JNM Commandeur ([j.n.m.commandeur@vu.nl](mailto:j.n.m.commandeur@vu.nl)) and, more specifically, by PhD-students and postdocs of the section Molecular Toxicology.

## Major Research Project DDS Molecular Toxicology, DDSA

<b>Course code</b>	X_432561 (432561)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	48.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. J.N.M. Commandeur
<b>Examinator</b>	dr. J.N.M. Commandeur
<b>Level</b>	600

### Course objective

To perform research in the area of molecular and biochemical toxicology and to get familiar with experimental approaches used in this field.

To define a hypothesis based on previous observations or publications, and to design, execute and critically interpret the experiments

performed to test specific hypotheses.

### Course content

The research project will be carried out in the context in one of the PhD- or postdoc-projects which are carried out in the section Molecular Toxicology.

Generally, the research is focussed on the role of drug metabolising enzymes, such as cytochromes P450, glutathione transferases, sulfotransferases, etc. in the bioactivation and bioinactivation of toxic drugs and other chemicals, identification of genetically determined enzymes, drug-drug interactions, the identification of reactive intermediates and cellular targets of reactive intermediates and cellular responses related to cytotoxicity or adaptation reactions.

### Form of tuition

Experimental research project, starting with a brief literature survey on the topic to be investigated.

### Type of assessment

Written report, (participation to) work discussions, and oral presentation in the section of Molecular Toxicology.

### Course reading

Relevant reviews will be provided at the start of the project.

### Recommended background knowledge

Courses ADMET, Drug-induced stress and cellular signalling or equivalent courses.

### Target group

mDDS-DDSA

### Remarks

Registration for a research project should be ultimately 4 weeks in advance. General information on projects to which the student can participate will be provided by master coordinator dr JNM Commandeur ([j.n.m.commandeur@vu.nl](mailto:j.n.m.commandeur@vu.nl)) and, more specifically, by PhD-students and postdocs of the section Molecular Toxicology.

Lecturers:

dr. J.N.M. Commandeur

dr. J.C. Vos

## Major Research Project DDS Molecular Toxicology, DDSA

<b>Course code</b>	X_432562 (432562)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	54.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. J.N.M. Commandeur
<b>Examinator</b>	dr. J.N.M. Commandeur
<b>Level</b>	600



### Course objective

To perform research in the area of molecular and biochemical toxicology and to get familiar with experimental approaches used in this field.

To define a hypothesis based on previous observations or publications, and to design, execute and critically interpret the experiments performed to test specific hypotheses.

### Course content

The research project will be carried out in the context in one of the PhD- or postdoc-projects which are carried out in the section Molecular Toxicology.

Generally, the research is focussed on the role of drug metabolising enzymes, such as cytochromes P450, glutathione transferases, sulfotransferases, etc. in the bioactivation and bioinactivation of toxic drugs and other chemicals, identification of genetically determined enzymes, drug-drug interactions, the identification of reactive intermediates and cellular targets of reactive intermediates and cellular responses related to cytotoxicity or adaptation reactions.

### Form of tuition

Experimental research project, starting with a brief literature survey on the topic to be investigated.

### Type of assessment

Written report, (participation to) work discussions, and oral presentation in the section of Molecular Toxicology.

### Course reading

Relevant reviews will be provided at the start of the project.

### Recommended background knowledge

Courses ADMET, Drug-induced stress and cellular signalling or equivalent courses.

### Target group

mDDS-DDSA

### Remarks

Registration for a research project should be ultimately 4 weeks in advance. General information on projects to which the student can participate will be provided by master coordinator dr JNM Commandeur ([j.n.m.commandeur@vu.nl](mailto:j.n.m.commandeur@vu.nl)) and, more specifically, by PhD-students and postdocs of the section Molecular Toxicology.

Lecturers:

dr. J.N.M. Commandeur

dr. J.C. Vos

## Major Research Project DDS Molecular Toxicology, DDSA

<b>Course code</b>	X_432563 (432563)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	60.0
<b>Language of tuition</b>	English

<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. J.N.M. Commandeur
<b>Examinator</b>	dr. J.N.M. Commandeur
<b>Level</b>	600

### Course objective

To perform research in the area of molecular and biochemical toxicology and to get familiar with experimental approaches used in this field.

To define a hypothesis based on previous observations or publications, and to design, execute and critically interpret the experiments performed to test specific hypotheses.

### Course content

The research project will be carried out in the context in one of the PhD- or postdoc-projects which are carried out in the section Molecular Toxicology.

Generally, the research is focussed on the role of drug metabolising enzymes, such as cytochromes P450, glutathione transferases, sulfotransferases, etc. in the bioactivation and bioinactivation of toxic drugs and other chemicals, identification of genetically determined enzymes, drug-drug interactions, the identification of reactive intermediates and cellular targets of reactive intermediates and cellular responses related to cytotoxicity or adaptation reactions.

### Form of tuition

Experimental research project, starting with a brief literature survey on the topic to be investigated.

### Type of assessment

Written report, (participation to) work discussions, and oral presentation in the section of Molecular Toxicology.

### Course reading

Relevant reviews will be provided at the start of the project.

### Recommended background knowledge

Courses ADMET, Drug-induced stress and cellular signalling or equivalent courses.

### Target group

mDDS-DDSA

### Remarks

Registration for a research project should be ultimately 4 weeks in advance. General information on projects to which the student can participate will be provided by master coordinator dr JNM Commandeur ([j.n.m.commandeur@vu.nl](mailto:j.n.m.commandeur@vu.nl)) and, more specifically, by PhD-students and postdocs of the section Molecular Toxicology

### Lecturers:

dr. J.N.M. Commandeur

dr. J.C. Vos

## Major Research Project DDS Molecular Toxicology, DDSA (C,E,M)

<b>Course code</b>	X_432731 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	24.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. J.N.M. Commandeur
<b>Examinator</b>	dr. J.N.M. Commandeur
<b>Level</b>	600

### Course objective

To perform research in the area of molecular and biochemical toxicology and to get familiar with experimental approaches used in this field.

To define a hypothesis based on previous observations or publications, and to design, execute and critically interpret the experiments performed to test specific hypotheses.

### Course content

The research project will be carried out in the context in one of the PhD- or postdoc-projects which are carried out in the section Molecular Toxicology.

Generally, the research is focussed on the role of drug metabolising enzymes, such as cytochromes P450, glutathione transferases, sulfotransferases, etc. in the bioactivation and bioinactivation of toxic drugs and other chemicals, identification of genetically determined enzymes, drug-drug interactions, the identification of reactive intermediates and cellular targets of reactive intermediates and cellular responses related to cytotoxicity or adaptation reactions.

### Form of tuition

Experimental research project, starting with a brief literature survey on the topic to be investigated.

### Type of assessment

Written report, (participation to) work discussions, and oral presentation in the section of MOlecular Toxicology.

### Course reading

Relevant reviews will be provided at the start of the project.

### Recommended background knowledge

Courses ADMET, Drug-induced stress and cellular signalling or equivalent courses,

### Target group

mDDS-DDSA

### Remarks

Registration for a research project should be ultimately 4 weeks in advance. General information on projects to which the student can participate will be provided by master coordinator dr JNM Commandeur ([j.n.m.commandeur@vu.nl](mailto:j.n.m.commandeur@vu.nl)) and, more specifically, by PhD-students and postdocs of the section Molecular Toxicology

Lecturers:

### Major Research Project Med. Chem., Drug Disc. & Target Find.

<b>Course code</b>	X_432550 (432550)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	48.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. M.H. Siderius
<b>Examinator</b>	dr. M.H. Siderius
<b>Level</b>	600

### Major Research Project Med. Chem., Drug Disc. & Target Find.

<b>Course code</b>	X_432551 (432551)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	54.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. M.H. Siderius
<b>Examinator</b>	dr. M.H. Siderius
<b>Level</b>	600

### Major Research Project Med. Chem., Drug Disc. & Target Find.

<b>Course code</b>	X_432552 (432552)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	60.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. M.H. Siderius
<b>Examinator</b>	dr. M.H. Siderius
<b>Level</b>	600

### Major Research Project Med. Chem., Drug Disc. & Target Find.

<b>Course code</b>	X_432547 (432547)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	42.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. M.H. Siderius
<b>Examinator</b>	dr. M.H. Siderius

<b>Level</b>	600
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**Remarks**

Period: variable

Major Research Project Mol. Tox., Comp. Med. Chem. & Tox.

<b>Course code</b>	X_432553 (432553)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	42.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. D.P. Geerke
<b>Examinator</b>	dr. D.P. Geerke
<b>Level</b>	600

Major Research Project Mol. Tox., Comp. Med. Chem. & Tox.

<b>Course code</b>	X_432556 (432556)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	48.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. D.P. Geerke
<b>Examinator</b>	dr. D.P. Geerke
<b>Level</b>	600

Major Research Project Mol. Tox., Comp. Med. Chem. & Tox.

<b>Course code</b>	X_432557 (432557)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	54.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. D.P. Geerke
<b>Examinator</b>	dr. D.P. Geerke
<b>Level</b>	600

Major Research Project Mol. Tox., Comp. Med. Chem. & Tox.

<b>Course code</b>	X_432558 (432558)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	60.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen

<b>Coordinator</b>	dr. D.P. Geerke
<b>Examinator</b>	dr. D.P. Geerke
<b>Level</b>	600

## Managing Science and Technology in Society

<b>Course code</b>	AM_470586 ()
<b>Period</b>	Period 1
<b>Credits</b>	6.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Fac. der Aard- en Levenswetenschappen
<b>Coordinator</b>	dr. T.J. Schuitmaker-Warnaar
<b>Examinator</b>	dr. T.J. Schuitmaker-Warnaar
<b>Teaching staff</b>	dr. B.J. Regeer, dr. J.F.H. Kupper, dr. C.W.M. Dedding, dr. T.J. Schuitmaker-Warnaar, prof. dr. J.E.W. Broerse
<b>Teaching method(s)</b>	Lecture, Study Group
<b>Level</b>	600

### Course objective

In this course, students:

- acquire knowledge and understanding of philosophical and social science theories on science and technology development.
- gain insight into the mutual shaping of science & technology and society.
- acquire knowledge and understanding of the basic concepts and issues in the field of science and technology studies.
- acquire knowledge and understanding of technological development through Responsible Research and Innovation
- acquire knowledge and understanding of interactive methods for directing and guiding developments in science and technology.
- gain insight into the need for democratization of science and technology.
- learn to recognize and operate the central STS concepts in their own life worlds.
- learn to communicate verbally and in scientific writing about their knowledge and understanding and to critically reflect on that.

### Course content

The 'Managing Science and Technology in Society' course offers an advanced introduction into the academic field of 'Science Technology & Society Studies'.

As an MPA student you are trained to operate at the interface of your natural science discipline and society, thereby making a contribution to answering the complex social problems arising in these areas. At the dawn of the 21st century, technology and science have an enormous potential for transforming life on earth. At the same time, the dimensions of our human culture shape the directions in which science and technology develop. The production of scientific knowledge and technological artefacts can solve some of our problems, but at the same time they give rise to new problems. During this course you will study the interactions of science and technology with society, and the various ways in which they mutually shape one another. These interactions invoke a lot of questions. Should we embrace genetically modified food? How do

new human reproductive technologies interfere with the way we deal with sexuality and social responsibilities?

In this course you will get acquainted with a conceptual framework to critically assess these kinds of questions. It aims at understanding the intertwinement of science, technology and society, and the importance of a broad concern with these interactions, in order to shape our future in the way that we want it.

### Form of tuition

'Managing Science and Technology in Society' is a fulltime course of four weeks (6 ECTS). The course schedule is available on blackboard.

Tuition methods include lectures, work groups, a group project and self-study.

The different elements have the following study time:

- lectures: 22 hours
- work groups: 12 hours
- group project: 32 hours
- examination (take-home: 14 hours
- self study (including mini-essays): remaining hours

### Type of assessment

The examination consists of:

- Mini-essay 1 (20%)
- Mini-essay 2 (20%)
- Final essay (take-home essay exam) (40%)
- SCOB-project (20%)

All parts need to be passed.

### Course reading

The literature of this course consists of selected chapters from the book An introduction to science and technology studies, Sergio Sismondo 2010, which can be purchased at the VU book shop. Complementary articles are provided for via blackboard, august 2015.

### Target group

Compulsory course within the second year of the Master Management, Policy Analysis and Entrepreneurship for the Health and Life Sciences (MPA)

### Remarks

Guest Lecturers:

- Wouter Mensink (SCP, UvA)
- Harro van Lente (UU)
- Steven Flipse (TU Delft, De Proeffabriek)

and others

More information: [T.J.Schuitmaker@vu.nl](mailto:T.J.Schuitmaker@vu.nl)

## Mass Spectrometry

<b>Course code</b>	X_435604 (435604)
<b>Period</b>	Period 2
<b>Credits</b>	6.0
<b>Language of tuition</b>	English

<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Level</b>	400

### Course content

<http://studiegids.uva.nl/web/uva/sgs/nl/c/229.html>

### Remarks

Registration via <https://www.sis.uva.nl> is mandatory 4 weeks before the start of the Semester.

## Minor Research Project Biomol. Drug Analysis

<b>Course code</b>	X_432658 (432658)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	24.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. H. Lingeman
<b>Examinator</b>	dr. H. Lingeman
<b>Level</b>	500

### Course objective

To acquire knowledge and insight into the role and objective of drug, bio-analytical and clinical development processes in complex samples using LC-MS and bio-assay-MS based approaches.

### Course content

This project aims to provide the student with a theoretical and practical understanding of the issues involved in the design, conduct, analyses and interpretation of complex analytical studies.

### Target group

mDDS

### Remarks

For further information please contact Henk Lingeman.

## Minor Research Project Biomol. Drug Analysis

<b>Course code</b>	X_432704 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	30.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. H. Lingeman
<b>Examinator</b>	dr. H. Lingeman
<b>Level</b>	500

### Course objective

To acquire knowledge and insight into the role and objective of drug, bio-analytical and clinical development processes in complex samples



using LC-MS and bio-assay-MS based approaches.

#### Course content

This project aims to provide the student with a theoretical and practical understanding of the issues involved in the design, conduct, analyses and interpretation of complex analytical studies.

#### Target group

mDDS

#### Remarks

For further information please contact Henk Lingeman.

### Minor Research Project Biomolecular Drug Analysis

<b>Course code</b>	X_432689 (432689)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	18.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. H. Lingeman
<b>Examinator</b>	dr. H. Lingeman
<b>Level</b>	500

#### Course objective

To acquire knowledge and insight into the role and objective of drug, bio-analytical and clinical development processes in complex samples using LC-MS and bio-assay-MS based approaches.

#### Course content

This project aims to provide the student with a theoretical and practical understanding of the issues involved in the design, conduct, analyses and interpretation of complex analytical procedures.

#### Target group

mDDS

#### Remarks

For further information please contact Henk Lingeman.

### Minor Research Project DDS Medicinal Chemistry, DD&S

<b>Course code</b>	X_432692 (432692)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	18.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. M. Wijtmans
<b>Examinator</b>	dr. M. Wijtmans
<b>Level</b>	500

**Course objective**

To obtain experience in design and/or synthesis techniques and in doing scientific research.

**Course content**

Within medicinal chemistry research, computational chemistry and organic synthesis play a major role in designing and preparing small organic ligands as e.g. protein modulators. During the traineeship, a student from another background can actively participate in a medicinal chemistry research project. The focus can be on organic synthesis, or on drug design. Attention will be paid to setting up research experiments, using state-of-the-art experimental techniques, analyzing experimental results and keeping adequate documentation.

**Type of assessment**

Presentation, report, practical work.

**Course reading**

Will be provided by the supervisor. The first 1-2 weeks of the traineeship will be spent on literature reading.

**Entry requirements**

Entry requirements may apply. Contact the coordinator well in advance.

**Recommended background knowledge**

Thorough knowledge of organic chemistry.

**Target group**

mDDS, mCh

**Registration procedure**

Please contact the coordinator well in advance.

**Minor Research Project DDS Medicinal Chemistry, DD&S**

<b>Course code</b>	X_432693 (432693)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	24.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. M. Wijtmans
<b>Examinator</b>	dr. M. Wijtmans
<b>Level</b>	500

**Course objective**

To obtain experience in design and/or synthesis techniques and in doing scientific research.

**Course content**

Within medicinal chemistry research, computational chemistry and organic synthesis play a major role in designing and preparing small organic ligands as e.g. protein modulators. During the traineeship, a student from another background can actively participate in a medicinal chemistry research project. The focus can be on organic synthesis, or on drug design. Attention will be paid to setting up research

experiments, using state-of-the-art experimental techniques, analyzing experimental results and keeping adequate documentation.

**Type of assessment**

Presentation, report, practical work.

**Course reading**

Will be provided by the supervisor. The first 1-2 weeks of the traineeship will be spent on literature reading.

**Entry requirements**

Entry requirements may apply. Contact the coordinator well in advance.

**Recommended background knowledge**

Thorough knowledge of organic chemistry.

**Target group**

mDDS, mCh

**Registration procedure**

Please contact the coordinator well in advance.

## Minor Research Project DDS Medicinal Chemistry, DD&S

<b>Course code</b>	X_432705 (432705)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	30.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. M. Wijtmans
<b>Examinator</b>	dr. M. Wijtmans
<b>Level</b>	500

**Course objective**

To obtain experience in design and/or synthesis techniques and in doing scientific research.

**Course content**

Within medicinal chemistry research, computational chemistry and organic synthesis play a major role in designing and preparing small organic ligands as e.g. protein modulators. During the traineeship, a student from another background can actively participate in a medicinal chemistry research project. The focus can be on organic synthesis, or on drug design. Attention will be paid to setting up research experiments, using state-of-the-art experimental techniques, analyzing experimental results and keeping adequate documentation.

**Type of assessment**

Presentation, report, practical work.

**Course reading**

Will be provided by the supervisor. The first 1-2 weeks of the traineeship will be spent on literature reading.

**Entry requirements**

Entry requirements may apply. Contact the coordinator well in advance.

**Recommended background knowledge**

Thorough knowledge of organic chemistry.

**Target group**

mDDS, mCh

**Registration procedure**

Please contact the coordinator well in advance.

## Minor Research Project DDS Molecular Toxicology, CMCT

<b>Course code</b>	X_432632 (432632)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	24.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. D.P. Geerke
<b>Examinator</b>	dr. D.P. Geerke
<b>Level</b>	500

## Minor Research Project DDS Molecular Toxicology, DDSA

<b>Course code</b>	X_432591 (432591)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	24.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. J.N.M. Commandeur
<b>Examinator</b>	dr. J.N.M. Commandeur
<b>Level</b>	500

**Course objective**

To perform research in the area of molecular and biochemical toxicology and to get familiar with experimental approaches used in this field.

To define a hypothesis based on previous observations or publications, and to design, execute and critically interpret the experiments performed to test specific hypotheses.

**Course content**

The research project will be carried out in the context in one of the PhD- or postdoc-projects which are carried out in the section Molecular Toxicology.

Generally, the research is focussed on the role of drug metabolising enzymes, such as cytochromes P450, glutathione transferases, sulfotransferases, etc. in the bioactivation and bioinactivation of toxic drugs and other chemicals, identification of genetically determined enzymes, drug-drug interactions, the identification of reactive intermediates and cellular targets of reactive intermediates and cellular responses related to cytotoxicity or adaptation reactions.

**Form of tuition**

Experimental research project, starting with a brief literature survey on the topic to be investigated.

**Type of assessment**

Written report, (participation to) work discussions, and oral presentation in the section of Molecular Toxicology.

**Course reading**

Relevant reviews will be provided at the start of the project.

**Recommended background knowledge**

Courses ADMET, Drug-induced stress and cellular signalling or equivalent courses.

**Target group**

mDDS-DDTF, mDDS-CMCT, mDDS-DD&S, mDDS-BCCA

**Remarks**

Registration for a research project should be ultimately 4 weeks in advance. General information on projects to which the student can participate will be provided by master coordinator dr JNM Commandeur ([j.n.m.commandeur@vu.nl](mailto:j.n.m.commandeur@vu.nl)) and, more specifically, by PhD-students and postdocs of the section Molecular Toxicology.

Lecturers:

dr. J.N.M. Commandeur

dr. J.C. Vos

**Minor Research Project DDS Molecular Toxicology, DDSA**

<b>Course code</b>	X_432592 (432592)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	30.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. J.N.M. Commandeur
<b>Examinator</b>	dr. J.N.M. Commandeur
<b>Level</b>	500

**Course objective**

To perform research in the area of molecular and biochemical toxicology and to get familiar with experimental approaches used in this field.

To define a hypothesis based on previous observations or publications, and to design, execute and critically interpret the experiments performed to test specific hypotheses.

**Course content**

The research project will be carried out in the context in one of the PhD- or postdoc-projects which are carried out in the section Molecular Toxicology.

Generally, the research is focussed on the role of drug metabolising enzymes, such as cytochromes P450, glutathione transferases,

sulfotransferases, etc. in the bioactivation and bioinactivation of toxic drugs and other chemicals, identification of genetically determined enzymes, drug-drug interactions, the identification of reactive intermediates and cellular targets of reactive intermediates and cellular responses related to cytotoxicity or adaptation reactions.

#### **Form of tuition**

Experimental research project, starting with a brief literature survey on the topic to be investigated.

#### **Type of assessment**

Written report, (participation to) work discussions, and oral presentation in the section of Molecular Toxicology.

#### **Course reading**

Relevant reviews will be provided at the start of the project.

#### **Recommended background knowledge**

Courses ADMET, Drug-induced stress and cellular signalling or equivalent courses.

#### **Target group**

mDDS-DDTF, mDDS-CMCT, mDDS-DD&S, mDDS-BCCA

#### **Remarks**

Registration for a research project should be ultimately 4 weeks in advance. General information on projects to which the student can participate will be provided by master coordinator dr JNM Commandeur ([j.n.m.commandeur@vu.nl](mailto:j.n.m.commandeur@vu.nl)) and, more specifically, by PhD-students and postdocs of the section Molecular Toxicology.

Lecturers:

dr. J.N.M. Commandeur

dr. J.C. Vos

## **Minor Research Project DDS Molecular Toxicology, DDSA**

<b>Course code</b>	X_432620 (432620)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	18.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. J.N.M. Commandeur
<b>Examinator</b>	dr. J.N.M. Commandeur
<b>Level</b>	500

#### **Course objective**

To perform research in the area of molecular and biochemical toxicology and to get familiar with experimental approaches used in this field.

To define a hypothesis based on previous observations or publications, and to design, execute and critically interpret the experiments performed to test specific hypotheses.

### Course content

The research project will be carried out in the context in one of the PhD- or postdoc-projects which are carried out in the section Molecular Toxicology.

Generally, the research is focussed on the role of drug metabolising enzymes, such as cytochromes P450, glutathione transferases, sulfotransferases, etc. in the bioactivation and bioinactivation of toxic drugs and other chemicals, identification of genetically determined enzymes, drug-drug interactions, the identification of reactive intermediates and cellular targets of reactive intermediates and cellular responses related to cytotoxicity or adaptation reactions.

### Form of tuition

Experimental research project, starting with a brief literature survey on the topic to be investigated.

### Type of assessment

Written report, (participation to) work discussions, and oral presentation in the section of Molecular Toxicology.

### Course reading

Relevant reviews will be provided at the start of the project.

### Recommended background knowledge

Courses ADMET, Drug-induced stress and cellular signalling or equivalent courses.

### Target group

mDDS-DDTF, mDDS-CMCT, mDDS-DD&S, mDDS-BCCA

### Remarks

Registration for a research project should be ultimately 4 weeks in advance. General information on projects to which the student can participate will be provided by master coordinator dr JNM Commandeur ([j.n.m.commandeur@vu.nl](mailto:j.n.m.commandeur@vu.nl)) and, more specifically, by PhD-students and postdocs of the section Molecular Toxicology.

### Lecturers:

dr. J.N.M. Commandeur

dr. J.C. Vos

## Minor Research Project DDS, CMCT

Course code	X_432507 (432507)
Period	Ac. Year (September)
Credits	18.0
Language of tuition	English
Faculty	Faculteit der Exacte Wetenschappen
Coordinator	dr. D.P. Geerke
Examinator	dr. D.P. Geerke
Level	500

### Course content

Period: Variable

## Minor Research Project DDS, CMCT

<b>Course code</b>	X_432707 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	30.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. D.P. Geerke
<b>Examinator</b>	dr. D.P. Geerke
<b>Level</b>	500

## Minor Research Project Med. Chem., Drug Disc. & Target Find.

<b>Course code</b>	X_432696 (432696)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	18.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. M.H. Siderius
<b>Examinator</b>	dr. M.H. Siderius
<b>Level</b>	500

### Remarks

Period: variable

## Minor Research Project Med. Chem., Drug Disc. & Target Find.

<b>Course code</b>	X_432706 (432706)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	30.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. M.H. Siderius
<b>Examinator</b>	dr. M.H. Siderius
<b>Level</b>	500

## Minor Research Project Med. Chem., Drug Disc. & Target Find.

<b>Course code</b>	X_432635 (432635)
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	24.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. M.H. Siderius



<b>Examinator</b>	dr. M.H. Siderius
<b>Level</b>	500

## Peergroup 1

<b>Course code</b>	O_MLPEERGR_1 ()
<b>Period</b>	Period 1+2+3, Period 4+5+6
<b>Credits</b>	0.0
<b>Language of tuition</b>	Dutch
<b>Faculty</b>	Fac. der Gedrags- en Bewegingswetensch.
<b>Coordinator</b>	dr. A. Handelzalts
<b>Examinator</b>	dr. A. Handelzalts
<b>Teaching method(s)</b>	Study Group
<b>Level</b>	400

## Peergroup 2

<b>Course code</b>	O_MLPEERGR_2 ()
<b>Period</b>	Period 3+4+5
<b>Credits</b>	0.0
<b>Language of tuition</b>	Dutch
<b>Faculty</b>	Fac. der Gedrags- en Bewegingswetensch.
<b>Coordinator</b>	dr. A. Handelzalts
<b>Examinator</b>	dr. A. Handelzalts
<b>Teaching method(s)</b>	Study Group

## Physical-Organic Chemistry

<b>Course code</b>	X_435663 (435663)
<b>Period</b>	Period 1
<b>Credits</b>	6.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	prof. dr. K. Lammertsma
<b>Examinator</b>	prof. dr. K. Lammertsma
<b>Teaching method(s)</b>	Lecture, Seminar
<b>Level</b>	400

### Course objective

Survey of structural features, reaction mechanisms, and physical organic concepts needed in organic chemistry.

### Course content

Advanced organic chemistry course centered around chemical bonding, stereochemical principles, conformational and stereo-electronic effects, isotope effects, reaction mechanisms, nucleophilic

substitutions, eliminations, aromaticity, carbocations, carbanions, radicals, pericyclic reactions, and acid-base catalysis. These structural and mechanistic concepts are essential in organic synthesis.

### Form of tuition

Lectures and tutorials with homework

### Type of assessment

Written or oral examination and assignments.

### Course reading

Anslyn, E.V., and Duggerty, D.A., Modern Physical Organic Chemistry. University Science Books, 2006.

### Entry requirements

BSc

### Recommended background knowledge

BSc S, BSc F

### Target group

mCh, mF

## Policy, Politics and Participation

<b>Course code</b>	AM_470589 ()
<b>Period</b>	Period 2
<b>Credits</b>	6.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Fac. der Aard- en Levenswetenschappen
<b>Coordinator</b>	dr. R.M. Edelenbosch MSc
<b>Examinator</b>	dr. R.M. Edelenbosch MSc
<b>Teaching staff</b>	dr. B.J. Regeer, dr. J.F.H. Kupper, prof. dr. J.E.W. Broerse
<b>Teaching method(s)</b>	Lecture, Study Group
<b>Level</b>	500

### Course objective

To further deepen your analytic skills with respect to the assessment of a specific societal problem;

To acquire further insight into the practice of interactive research;

To acquire further insights into specific methods and techniques of interactive research;

To strengthen the skills to design an interactive research project

To practice skills in data collection and analysis;

To learn to set up valid lines of argumentation;

To improve your communication skills;

To improve your skills in working effectively in a project team, through team building, team analysis and feedback.

### Course content

In this course you get the chance to gain experience in the practical implementation of methodologies for interactive research. In a four week policy project you will both improve your focus group research skills and deepen your understanding of the relevant theoretical concepts in

the areas of policy studies, science and technology studies and democracy theory. In a group of about ten students you will participate in a real interactive research project which is executed at the Athena institute. In this project you will be trained in and practice various skills for data collection (such as focus group design and facilitation) and data analysis (such as qualitative content analysis).

Specific attention is paid to your personal interactive research skills. At the end of the course, you prepare a policy report to present your findings. In an oral presentation your team will highlight the main results of your analysis and defend the recommendations you propose.

### **Form of tuition**

Lectures: 14 hours

Training workshops: 4 hours

Project assignment: 102 hours

focus group execution: 6 hours

Final presentations project results: 4 hours

Self study: remaining hours

### **Type of assessment**

The course does not have an oral or written exam. You will be assessed on the basis of the group assignment, a group presentation and on your individual performance during the course (in the work groups, your facilitation skills in the 'real' focus groups). For all parts a pass grade (> 5.5) needs to be obtained in order to receive a final mark.

Your final mark will be based on: the group report (40%): oral presentation per group(40%): individual performance (20%).

### **Course reading**

To be announced on Blackboard

### **Entry requirements**

Basic knowledge of (interactive) policy processes, policy analysis and relevant research skills are required.

### **Target group**

Optional course for Master students Management, Policy Analysis and Entrepreneurship in Health and Life sciences (MPA), Societal differentiation of the Health, Life & Natural Sciences.

### **Registration procedure**

Registration deadline by VUnet is 4 weeks before the start of the course.

### **Remarks**

As the project depends on team work, attendance is compulsory.

## **Praktijk 1**

<b>Course code</b>	O_MLPRAK_1 ()
<b>Period</b>	Period 1, Period 4
<b>Credits</b>	6.0
<b>Language of tuition</b>	Dutch
<b>Faculty</b>	Fac. der Gedrags- en Bewegingswetensch.
<b>Coordinator</b>	dr. A. Handelzalts

<b>Examinator</b>	dr. A. Handelzalts
<b>Teaching staff</b>	drs. J.K.W. Riksen, drs. H.R. Goudsmit, drs. Y.G. Meindersma, ir. E.J.F. Scheringa, drs. W.S. Hoekstra, drs. C.D.P. van Oeveren, drs. S. Donszelmann, drs. L.J. van Well-van Grootheest, dr. H.B. Westbroek, C.L. Geraedts, drs. A. Krijgsman, dr. A.A. Kaal, dr. A. Handelzalts, drs. K.L. Schaap, W. Maas, F.L. de Vries MSc, drs. H. Stouthart, drs. I. Pauw
<b>Teaching method(s)</b>	Study Group
<b>Level</b>	400

## Praktijk 2

<b>Course code</b>	O_MLPRAK_2 ()
<b>Period</b>	Period 2+3, Period 5+6
<b>Credits</b>	9.0
<b>Language of tuition</b>	Dutch
<b>Faculty</b>	Fac. der Gedrags- en Bewegingswetensch.
<b>Coordinator</b>	dr. A. Handelzalts
<b>Examinator</b>	dr. A. Handelzalts
<b>Teaching staff</b>	drs. J.K.W. Riksen, drs. H.R. Goudsmit, drs. Y.G. Meindersma, ir. E.J.F. Scheringa, drs. W.S. Hoekstra, drs. C.D.P. van Oeveren, drs. S. Donszelmann, dr. H.B. Westbroek, C.L. Geraedts, drs. A. Krijgsman, dr. A.A. Kaal, dr. A. Handelzalts, drs. K.L. Schaap, W. Maas, F.L. de Vries MSc, drs. H. Stouthart, drs. I. Pauw
<b>Teaching method(s)</b>	Study Group
<b>Level</b>	400

## Praktijk 3

<b>Course code</b>	O_MLPRAK_3 ()
<b>Period</b>	Period 4+5+6
<b>Credits</b>	15.0
<b>Language of tuition</b>	Dutch
<b>Faculty</b>	Fac. der Gedrags- en Bewegingswetensch.
<b>Coordinator</b>	dr. A. Handelzalts
<b>Examinator</b>	dr. A. Handelzalts
<b>Teaching staff</b>	drs. J.K.W. Riksen, drs. H.R. Goudsmit, drs. Y.G. Meindersma, ir. E.J.F. Scheringa, drs. W.S. Hoekstra, drs. C.D.P. van Oeveren, drs. S. Donszelmann, dr. H.B. Westbroek, C.L. Geraedts, drs. A. Krijgsman, dr. A.A. Kaal, dr. A. Handelzalts, drs. K.L. Schaap, W. Maas, F.L. de Vries MSc, drs. H. Stouthart, drs. I. Pauw
<b>Level</b>	400

## Praktijk onderzoek 1

<b>Course code</b>	O_MLPROZ_1 ()
<b>Period</b>	Period 3, Period 6
<b>Credits</b>	3.0
<b>Language of tuition</b>	Dutch
<b>Faculty</b>	Fac. der Gedrags- en Bewegingswetensch.
<b>Coordinator</b>	dr. H.B. Westbroek
<b>Examinator</b>	dr. H.B. Westbroek
<b>Teaching staff</b>	drs. J.K.W. Riksen, drs. H.R. Goudsmit, drs. Y.G. Meindersma, ir. E.J.F. Scheringa, dr. M. Meeter, drs. W.S. Hoekstra, drs. C.D.P. van Oeveren, drs. S. Donszelmann, drs. B. Klein, drs. W. Jongejan, drs. L.J. van Well-van Grootheest, dr. T. Bosma, dr. H.B. Westbroek, C.L. Geraedts, drs. A. Krijgsman, dr. J.M.H. Swennen, dr. A.A. Kaal, dr. A. Handelzalts, drs. K.L. Schaap, W. Maas, F.L. de Vries MSc, drs. H. Stouthart, drs. I. Pauw
<b>Teaching method(s)</b>	Study Group, Lecture
<b>Level</b>	400

## Praktijk onderzoek 2

<b>Course code</b>	O_MLPROZ_2 ()
<b>Period</b>	Period 4+5+6
<b>Credits</b>	6.0
<b>Language of tuition</b>	Dutch
<b>Faculty</b>	Fac. der Gedrags- en Bewegingswetensch.
<b>Coordinator</b>	dr. H.B. Westbroek
<b>Examinator</b>	dr. A. Handelzalts
<b>Teaching staff</b>	drs. J.K.W. Riksen, drs. H.R. Goudsmit, drs. Y.G. Meindersma, ir. E.J.F. Scheringa, dr. M. Meeter, drs. W.S. Hoekstra, drs. C.D.P. van Oeveren, drs. S. Donszelmann, drs. B. Klein, drs. W. Jongejan, drs. L.J. van Well-van Grootheest, dr. T. Bosma, dr. H.B. Westbroek, C.L. Geraedts, dr. J.M.H. Swennen, dr. A.A. Kaal, dr. A. Handelzalts, drs. K.L. Schaap, W. Maas, F.L. de Vries MSc, drs. H. Stouthart, drs. I. Pauw
<b>Teaching method(s)</b>	Lecture, Seminar
<b>Level</b>	400

## Principles of Pharmaceutical Sciences / Pharmacochimistry

<b>Course code</b>	X_435675 (435675)
<b>Period</b>	Period 1
<b>Credits</b>	6.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	prof. dr. I.J.P. de Esch
<b>Examinator</b>	prof. dr. I.J.P. de Esch
<b>Teaching staff</b>	prof. dr. I.J.P. de Esch

<b>Teaching method(s)</b>	Lecture
<b>Level</b>	400

### Course objective

General introduction into and deepening of knowledge of concepts, mechanisms and recent developments in pharmaceutical sciences and the pharmaceutical and biotech industry.

### Course content

This course is designed for students with an interest in life sciences and the biotech/pharmaceutical industry but without prior education in this field. A general introduction will be given to the process of drug discovery, drug design and synthesis, drug development and drug safety assessment. Subsequently, potential drug targets, mechanisms of drug actions (including drug-receptor/enzyme) Using various drug classes, relationships between chemical structures and biological activities will be derived and illustrated. Finally, various modern developments and tools will be illustrated by recent applications in the field of drug research, medicinal chemistry and toxicology.

### Form of tuition

Lectures and tutorials.

### Type of assessment

Written examination

### Course reading

Patrick, G., An Introduction to Medicinal Chemistry 5th ed.  
Oxford: Oxford University Press. 2009, ISBN: 978-0-19-969739-7

### Target group

3S, 3MNW, mCh, mPhys.

The course is optional for mDDS students that did not follow the VU University BSc Pharmaceutical sciences and these mDDS students should contact the mDDS coordinator before enrolling.

The course is recommended for SBI (life) mastertrack students, except for students with an bachelor in SBI or pharmaceutical sciences.

## Project Computational Design and Synthesis of Drugs

<b>Course code</b>	X_432734 ()
<b>Period</b>	Period 4
<b>Credits</b>	6.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. C. de Graaf
<b>Examinator</b>	dr. C. de Graaf
<b>Teaching staff</b>	dr. M. Wijtmans, dr. C. de Graaf, dr. D.P. Geerke
<b>Teaching method(s)</b>	Lecture, Practical
<b>Level</b>	400

### Course objective

To gain insight and experience in the molecular modeling tools that enable (rational) drug design and to examine and plan efficient routes

to synthesize conceived ligands.

### Course content

In the post-genome era, an overwhelming amount of data describing the molecular characteristics of the targets is becoming available. For example, the structure of many proteins is being determined using X-Ray analysis and NMR techniques. Furthermore, high-throughput screening results in massive amounts of data that reveal the molecular properties of the ligands that are able to have interaction with the drug targets. In this project, several techniques that can help to translate this data into novel ligands will be discussed and applied. Specific topics include crystal structure analysis, the building of homology models, docking of ligands, calculating binding free energy and affinity of ligands for the protein, de novo structure generation, and pharmacophore modeling. These techniques generate ideas for novel compounds. Because a design that cannot be synthesized is by definition a useless design, the synthetic feasibility is a key and integral part of the design process. Therefore, it is important to be able to define a synthetic pathway for the preparation of the designed compounds. In this project, this aspect will be covered by lectures on the concept of retrosynthesis and on the incorporation of some biologically relevant moieties, such as heteroaromatic scaffolds and known affinity-increasers. An online retrosynthetic demonstration with a search engine sets the stage for a case study. For a specific design, a versatile and robust synthesis route has to be defined. A thorough literature search, in combination with detailed study of the reactions involved will result in a report that describes the suggested chemistry in detail.

### Form of tuition

Project basis: including lectures, tutorials, self study, assignments and group-work on a case-study.

Teachers: Dr. C. de Graaf, Dr. M. Wijtman, Dr. D.P. Geerke, Prof. Dr. De Esch.

### Type of assessment

Written exam (50%), case study report (50%). Both the exam and the case study report should be passed.

### Course reading

Two eBooks contain several chapters of literature. These two books are:

Mason: Volume 4 of Comprehensive Medicinal Chemistry II:  
Computer-Assisted Drug Design (Mason (Ed)).  
<http://www.sciencedirect.com/science/referenceworks/9780080450445>

Hoffmann: Elements of Synthesis Planning (Hoffmann (Ed))  
<http://www.springerlink.com/content/j81646>

These books are accessible through UBVU at all VU computers. The same holds true for articles and the Reaxys search engine (vide infra). When at home, turn on the VU-proxy

(<http://www.ub.vu.nl/nl/faciliteiten/thuis-werken/index.asp>) and accessibility to all these items is maintained.

The following book (Clayden) is not an eBook accessible through UBVU, but it contains useful background literature on organic chemistry. All students that received their FAR BSc degree at the VU possess this book. It is suggested by us that such students could consider lending this book to others if necessary.

Clayden: Clayden, Organic Chemistry, Oxford University Press, 2001.

In the remainder of the guide, a distinction is made between integral literature and background literature.

Integral literature represents literature that is considered integral to the topic and hence is exam material.

Background literature either constitutes material for certain assignments or offers a wider or alternative discussion of the topic that an interested student can read at his/her own leisure. Background literature is not exam material.

### Entry requirements

Knowledge of basic organic chemistry.

### Target group

mDDS-BCCA, mDDS-CMCT, mDDS-DD&S, mDDS-DDSA, mDDS-DDTF, mDDS-C-var, mDDS-E-var, mDDS-M-var

## Protein Analysis

<b>Course code</b>	X_435045 (435045)
<b>Period</b>	Period 5
<b>Credits</b>	6.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. H. Lingeman
<b>Examinator</b>	dr. H. Lingeman
<b>Teaching staff</b>	dr. H. Lingeman
<b>Teaching method(s)</b>	Lecture
<b>Level</b>	500

### Course objective

Providing a clear overview on the principles and techniques that can be used for the qualitative and quantitative determination of protein-type of compounds.

### Course content

The qualitative and quantitative determination of protein frequently is performed by a combination of chromatographic /electrophoretic and mass spectrometric techniques. The principles of these techniques will be discussed as well as their applications. Special attention will be given to sample treatment procedures and affinity-based separation techniques. With respect to the identification of unknown biological macromolecules, the power of hyphenated techniques in combination with the various modes of mass spectrometry will be highlighted.

### Form of tuition

Lectures and tutorials

### Type of assessment

Oral examination.

### Course reading



Hand-outs (electronically available).

### Entry requirements

Basic knowledge of biochemistry, separation sciences, spectroscopy and mass spectrometry.

### Target group

mCh-AS, mCh-MDSC, mDDS-BCCA, mDDS-DDTF

## Reflective Practice Internship Science Communication

<b>Course code</b>	AM_1163 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	30.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Fac. der Aard- en Levenswetenschappen
<b>Coordinator</b>	dr. J.F.H. Kupper
<b>Level</b>	600

### Course objective

The internship is a compulsory part of the Master's programme. The aims of the internship are:

- Learn to independently apply and expand your practical science communication skills in one particular area of the field (writing, multi-media, facilitation, policy and strategy development, content design, etc.).
- Critical self-assessment and reflection on acquired science communication competencies in the field.
- Conduct scientific research independently: assess scientific information, design a research project, apply scientific methods, collect data, report and discuss findings.
- Present and discuss about internship and research outcomes.
- Learn to cooperate with researchers and practitioners of various disciplines.
- Gain an impression of a potential future field of career.

### Course content

When you are enrolled in the VU Science Communication specialization or the UvA Major Science Communication you need to conduct one internship (30 ECTS, 5 months). One of the two possible formats is the Reflective Practice Internship (RPI). The complete and up-to-date information about the internship can be found in the SC internship guide line on blackboard (science communication community).

### Form of tuition

Work-based placement

### Type of assessment

Written report and oral presentation.

Within six weeks after the start of the master internship, an interim evaluation will take place to assess whether there is a reasonable chance of the placement being brought to a successful completion. The internship is supervised and assessed by two lecturers. Both lecturers are members of the academic staff at VU University Amsterdam. The day-to-day supervision can be carried out by a trainee research assistant (AIO), postdoc or researcher.

## Target group

Students MSc Earth science year 2

## Remarks

Participation in this compulsory component is only permitted if the student meets the relevant requirements for admission. These requirements are detailed in the Internship guidelines of Earth science (on

Blackboard) and in the Academic and Examination Regulations.

The work-based placement is subject to the FALW document: "Student placement (internship) and literature regulations". These regulations require detailed written agreements between supervisors and student that specify the conditions for the Master research project. This agreement should be sent for approval by the science communication co-ordinator at least two weeks before the planned start of the work-based placement.

If the proposal is of sufficient quality, you can start your internship.

If not, you'll need to adapt your proposal and send it for approval again. You can only start your internship after your research design has been approved.

The placement may be extended by 6 EC, subject to conditions that can be found in the FALW document "Student placement (internship) and literature regulations". The student must send a request for extension to the Earth science Examination Board.

Information on Master internships is made available on Blackboard.

## Research I

<b>Course code</b>	O_MLVPOOI ()
<b>Period</b>	Period 1+2+3
<b>Credits</b>	3.0
<b>Language of tuition</b>	Dutch
<b>Faculty</b>	Fac. der Gedrags- en Bewegingswetensch.
<b>Coordinator</b>	dr. A. Handelzalts
<b>Examinator</b>	dr. A. Handelzalts
<b>Teaching staff</b>	drs. J.K.W. Riksen, drs. H.R. Goudsmit, drs. Y.G. Meindersma, drs. I. Pauw, drs. W.S. Hoekstra, drs. C.D.P. van Oeveren, drs. S. Donszelmann, drs. W. Jongejan, dr. H.B. Westbroek, C.L. Geraedts, drs. A. Krijgsman, prof. dr. J.J. Beishuizen, dr. A.A. Kaal, drs. K.L. Schaap, W. Maas, F.L. de Vries MSc, drs. H. Stouthart
<b>Teaching method(s)</b>	Lecture, Seminar
<b>Level</b>	500

## Research II

<b>Course code</b>	O_MLVPOOII ()
<b>Period</b>	Period 1+2+3
<b>Credits</b>	6.0
<b>Faculty</b>	Fac. der Gedrags- en Bewegingswetensch.
<b>Coordinator</b>	dr. H.B. Westbroek
<b>Examinator</b>	dr. H.B. Westbroek

<b>Teaching staff</b>	drs. W. Jongejan, dr. T. Bosma, dr. H.B. Westbroek, dr. A.A. Kaal, dr. A. Handelzalts, W. Maas
<b>Teaching method(s)</b>	Lecture, Seminar
<b>Level</b>	500

## Research Internship Science Communication

<b>Course code</b>	AM_1162 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	30.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Fac. der Aard- en Levenswetenschappen
<b>Coordinator</b>	dr. J.F.H. Kupper
<b>Level</b>	600

### Course objective

The internship is a compulsory part of the Master's programme. The aims of the internship are:

- Learn to independently apply and expand your practical science communication skills in one particular area of the field (writing, multi-media, facilitation, policy and strategy development, content design, etc.).
- Critical self-assessment and reflection on acquired science communication competencies in the field.
- Conduct scientific research independently: assess scientific information, design a research project, apply scientific methods, collect data, report and discuss findings.
- Present and discuss about internship and research outcomes.
- Learn to cooperate with researchers and practitioners of various disciplines.
- Gain an impression of a potential future field of career.

### Course content

When you are enrolled in the VU Science Communication specialization or the UvA Major Science Communication you need to conduct one internship (30 ECTS, 5 months). One of the two possible formats is the full Research Internship. The complete and up-to-date information about the internship can be found in the SC internship guide line on blackboard (science communication community).

### Form of tuition

Work-based placement

### Type of assessment

Written report and oral presentation.

Within six weeks after the start of the master internship, an interim evaluation will take place to assess whether there is a reasonable chance of the placement being brought to a successful completion.

The internship is supervised and assessed by two lecturers. Both lecturers are members of the academic staff at VU University Amsterdam.

The day-to-day supervision can be carried out by a trainee research assistant (AIO), postdoc or researcher.

**Target group**

Students Earth science year 2

**Remarks**

Participation in this compulsory component is only permitted if the student meets the relevant requirements for admission. These requirements are detailed in the Internship guideline of science communication (on

Blackboard) and in the Academic and Examination Regulations.

The work-based placement is subject to the FALW document: "Student placement (internship) and literature regulations". These regulations require detailed written agreements between supervisors and student that specify the conditions for the Master research project. This agreement should be sent for approval by the science communication internship or master co-ordinator

at least two weeks before the planned start of the work-based placement.

If the proposal is of sufficient quality, you can start your internship.

If not, you'll need to adapt your proposal and send it for approval again. You can only start your internship after your research design has been approved.

The placement may be extended by 6 EC, subject to conditions that can be found in the FALW document "Student placement (internship) and literature regulations". The student must send a request for extension to the earth science Examination Board.

Information on Master internships is made available on Blackboard.

## Research methods for analyzing complex problems

<b>Course code</b>	AM_1182 ()
<b>Period</b>	Period 1
<b>Credits</b>	6.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Fac. der Aard- en Levenswetenschappen
<b>Coordinator</b>	dr. M.E. Arentshorst MSc
<b>Examinator</b>	dr. M.E. Arentshorst MSc
<b>Teaching method(s)</b>	Lecture, Seminar, Computer lab
<b>Level</b>	400

**Course objective**

The objectives of this course are:

- To understand the differences between beta- and gamma research;
- To acquire insight in and understanding of a real world research process, including knowledge of the character of complex societal issues and the needs, advantages and disadvantages of real world research;
- To acquire insight into various quantitative and qualitative research methods, their underlying theoretical concepts and their relative strengths and weaknesses;
- Being able to apply these various quantitative and qualitative research methods in a specific societal context;
- To interpret quantitative and qualitative findings;
- Being able to create an adequate research design for the investigation of a specific complex societal problem.

## **Course content**

Contemporary societies increasingly face complex social problems, such as climate change, HIV/ AIDS or ethnic and religious diversity. These complex problems involve a variety of social actors: policy-makers, professionals, NGOs, industries, science and, of course, the public at large. Addressing these complex issues demands an approach that investigates, analyzes and integrates the positions and knowledge of different actors.

This course offers an (advanced) introduction to various research methods used in real world research, including questionnaires, systematic observations, surveys and statistics, semi-structured interviews, and focus groups. These methods are commonly used in research into complex problem contexts, communication and opportunities for intervention. Strengths and weaknesses of each research method and technique will be discussed, as well as its possibility to be applied in different societal contexts.

## **Form of tuition**

Research Methods for Analyzing Complex Problems is a fulltime course of four weeks (6 ECTS). The total study time is 160 hours. Tuition methods include lectures, workgroups, workshops, group project work and self-study.

The different elements have the following study time:

- lectures 20 hours
- workgroups and training 36 hours
- examination 3 hours
- project work & reading (self-study) Remaining hours

Please note that attendance to the workgroup sessions is compulsory. If you miss one workgroup, with a good reason, you will receive an additional assignment. If you miss more than one workgroup session it is no longer possible to pass the project part of the course.

Attendance to the lectures is highly recommended. In our experience, relying on self-study alone is insufficient to apply the theory of the lectures in the assignments of the workgroups, and to pass the exam.

## **Type of assessment**

The course grade is based on the group assignment 'study design' and the exam. Both aspects need to be graded 6.0 or higher.

Exam 50% of total grade

Group assignment 'study Design' 50% of total grade

## **Course reading**

The literature of this course consists of selected scientific articles that are provided on blackboard, and the books:

- Verschuren, D.E. and Doorewaard, H. (2010). Designing a Research Project

(2nd edition)Eleven International Publishing, the Hague. ISBN 978-90-5931-572-3.

- Gray, D.E. (2014) Doing Research in the Real World (3rd edition)Sage Publications Ltd, United Kingdom. ISBN 978-1-4462-6019-7

An overview of the literature per lecture will be provided on blackboard.

### Target group

The course 'Research Methods for Analyzing Complex Problems' is a compulsory course for first year master students 'Management, Policy Analysis and Entrepreneurship in Health and Life Sciences'. This course is also a compulsory course within the Science communication- and Societal differentiations of Health, Life and Natural Sciences Master programmes. It is an optional course for other Life Sciences Master program students at the VU University.

### Registration procedure

VUnet

### Remarks

Lectures are in English, part of the workgroups are in Dutch. The assignments are written in English.

Please note that attendance to the workgroup sessions is compulsory. If you miss one workgroup, with a good reason, you will receive an additional assignment. If you miss more than one workgroup session it is no longer possible to pass the project part of the course.

Attendance to the lectures is highly recommended. In our experience, relying on self-study alone is insufficient to apply the theory of the lectures in the assignments of the workgroups, and to pass the exam.

course coordinator: Marlous Arentshorst - [m.e.arentshorst@vu.nl](mailto:m.e.arentshorst@vu.nl)

## Science and Communication

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

<b>Course code</b>	AM_1002 ()
<b>Period</b>	Period 2
<b>Credits</b>	6.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Fac. der Aard- en Levenswetenschappen
<b>Coordinator</b>	dr. J.F.H. Kupper
<b>Examinator</b>	dr. J.F.H. Kupper
<b>Teaching staff</b>	dr. J.F.H. Kupper
<b>Teaching method(s)</b>	Study Group, Lecture, Seminar
<b>Level</b>	500

### **Course objective**

To gain knowledge of and insight into:

- the basic concepts and issues in the understanding of science-society interactions, both from a science and technology studies and communication science perspective
- the nature and course of interpersonal and group communication processes relevant to the formal and informal dialogue between science and society
- the nature and form of dialogical science communication, aimed at reflective learning and mutual understanding

To acquire or improve:

- individual skills for effective interpersonal communication
- individual skills for the design and facilitation of the science-society dialogue

### **Course content**

This course examines the public character of scientific controversy and focuses on the communicative aspects of a fruitful science-society dialogue. At the dawn of the 21st century, science, and particularly fields that combine science and engineering such as nanotechnology and synthetic biology, holds a great promise for the progress of our societies. At the same time, these developments are controversial. They lead to a variety of concerns related to risks, benefits and wider moral issues. Nanotechnology creates materials with novel characteristics that help us, but may also contain risks for health and environment. Synthetic biology develops new biological systems that may be very useful, but radically change the nature and meaning of life. Clearly, advances in science do not always match the needs, desires and expectations of society. On the other hand, parts of society might not always appreciate the nature and scope of scientific findings. For a fruitful relationship between science and society, a constructive science-society dialogue is necessary.

This course offers advanced lectures on the basic concepts and issues of dialogical science communication: communication, learning, dialogue, understanding, controversy, democracy. A series of workshops and small group assignments presents communicative tools and spaces such as discussion games, science theatre and multimedia platforms that can be used to design and facilitate science-society interactions. Training workshops will focus on improving the students' individual communication and facilitation skills. The students' individual learning curve as a science communicator and facilitator is self-evaluated by means of a reflection report.

Every course week is completed with a mini-exam.

### **Form of tuition**

Lectures (14h), Workgroups (28h), Training workshops (24h), Dialogue presentations (12h), Selfstudy (remaining hours)

### **Type of assessment**

Group assignment (50%), Take home exam (30%), Reflection report (20%). All assignments must be passed (grade > 6).

### **Course reading**

Is announced on blackboard one month before start of the course



**Target group**

Optional course in the MSc specialization Science Communication

**Remarks**

Independence and a cooperative attitude is expected. Attendance to training workshops is mandatory.

**Science Journalism**

<b>Course code</b>	AM_471014 ()
<b>Period</b>	Period 2
<b>Credits</b>	6.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Fac. der Aard- en Levenswetenschappen
<b>Coordinator</b>	dr. J.F.H. Kupper
<b>Examinator</b>	dr. J.F.H. Kupper
<b>Teaching staff</b>	dr. J.F.H. Kupper
<b>Teaching method(s)</b>	Lecture, Study Group, Computer lab
<b>Level</b>	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 defensible 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](mailto:f.kupper@vu.nl).

## Science Museology

<b>Course code</b>	AM_470590 ()
<b>Period</b>	Period 3
<b>Credits</b>	6.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Fac. der Aard- en Levenswetenschappen
<b>Coordinator</b>	dr. B.J. Regeer
<b>Examinator</b>	dr. B.J. Regeer
<b>Teaching staff</b>	dr. B.J. Regeer, drs. ir. M.G. van der Meij
<b>Teaching method(s)</b>	Lecture, Study Group, Seminar, Fieldwork
<b>Level</b>	500

### Course objective

- Gain insight in the role of museum exhibits in the field of science communication.
- Gain insight in the role of science communication concepts in the context of science museums.
- Apply qualitative research methods to design, conduct, and report on a user research project in museum settings.
- Apply theoretical notions of science communication and exhibit design to advise development of exhibit experience and content design.
- Gain experience in working for an external commissioner.

### Course content

This course is about the role of science museums/centers, zoos and natural history museums in science communication. You will get familiar with theories of science communication in museum settings, and will be

introduced to different styles of communication, different approaches to exhibit design & development, and different methods of research and evaluation of exhibitions.

Guest speakers and lecturers give insight into their profession (1) as science communicators in museums and science centers, (2) as researchers in the field of museology, and/or (3) as professionals in informal science & technology learning environments.

Through individual and group assignments you are encouraged to combine theory and practice, working step-by-step towards (part of) an exhibition (re-)design. The group assignments are commissioned by museums and science centers, such as NEMO, Museon, Naturalis, Delft Science Centre, and Artis.

### **Form of tuition**

Lectures

Workgroups

Workshops

Home-study for group assignments

Home-study for individual assignments

Field work

### **Type of assessment**

Group assignment (50%), presentation (poster and oral) (10%), and individual exam(s) (40%). For the assignments, presentations and all exams a pass-grade must be obtained.

### **Course reading**

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

### **Entry requirements**

It is possible to follow the course as an elective course outside of one of the science communication master specialisations of FALW/FEW. In that case additional reading may be required depending on the student's background.

### **Target group**

Optional course in the Science Communication master specialisation of most of the two-year master programs of the FALW and FEW faculties. Master students from other universities in any scientific field are welcome as well. Additional reading may be required.

### **Remarks**

Guest lectures from and excursions to for instance Artis, NEMO, Naturalis, NorthernLight, Museon, etc.

## **Scientific Writing in English**

<b>Course code</b>	X_400592 (400592)
<b>Period</b>	Period 2, Period 6
<b>Credits</b>	3.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	M. van den Hoorn
<b>Examinator</b>	M. van den Hoorn
<b>Teaching method(s)</b>	Lecture

**Course objective**

The aim of this course is to provide Master's students with the essential linguistic know-how for writing a scientific article 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 scientific article;
- know what the information elements are in parts of their scientific article;
- know how to produce clear and well-structured texts on complex subjects;
- know how to cite sources effectively;
- 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 what their own strengths and weaknesses are in writing;
- know how to give effective peer feedback.

Final texts may contain occasional spelling, grammatical or word choice errors, but these will not distract from the general effectiveness of the text.

**Course content**

The course will start with a general introduction to scientific writing in English. Taking a top-down approach, we will then analyse the structure of a scientific article in more detail. As we examine each section of an article, 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:

- Structuring a scientific article
- Considering reading strategies: who is your readership? How do they read your text? What do they expect? How does that affect your writing?
- Writing well-structured and coherent paragraphs
- Composing effective sentences (sophisticated word order, information distribution).
- Arguing convincingly – avoiding logical fallacies
- Academic tone and style: hedging – why, how, where?
- Using the passive effectively
- Understanding grammar (tenses, word order, etc.)
- Understanding punctuation
- Referring to sources: summarising, paraphrasing, quoting (how and when?)
- Avoiding plagiarism
- Vocabulary development: using appropriate vocabulary and collocations

**Form of tuition**

Scientific Writing in English is an eight-week course and consists of 2 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 (Introduction, Methods, Discussion and Abstract). Feedback on the writing assignments is given by the course teacher and by peers.

### **Type of assessment**

Students will receive the three course credits when they meet the following requirements:

- Students hand in three writing assignments (Introduction, Methods, Discussion)
- Students get a pass mark for all writing assignments;
- Students provide elaborate peer feedback (Introduction, Methods, Discussion, Abstract);
- Students attend at least 7 out of 8 sessions;
- Students are well prepared for each session (i.e. do all homework assignments);
- Students participate actively in class;
- Students do not plagiarise or self-plagiarise.

Writing assignments:

1. If students have a BSc thesis in a traditional thesis form (e.g., 20+ pages) and written in English, they may use this for the writing assignments.
2. If students have a BSc thesis in a traditional form (e.g., 20+ pages) written in another language than English, they may use this for the writing assignments.
3. If students have written a paper or report in English that's not already in article form, they may use this for the writing assignment.
4. If students are working on their MSc thesis or internship report when taking Scientific Writing in English, they may use this for the writing assignments. They will have to notify their supervisor to make sure that they won't be accused of self-plagiarism.
5. If students cannot or do not wish to use any of the above-mentioned texts for the writing assignments (1-4), they are expected to do a limited Literature Review on a topic in their field of research, using at least 5 articles.

Students are not allowed to use the following texts for the writing assignments:

1. A BSc thesis written in English that's already in article form.
2. A MSc thesis written in English that's already in article form (and that has already been marked).
3. An internship report written in English that's already in article form (and that has already been marked).
4. A paper or report written in English that's already in article form.

### **Course reading**

Effective Scientific Writing: An Advanced Learner's guide to Better English, 3rd edition (June 2013) (A. Bolt & W. Bruins, ISBN 978 90 8659 617 1). VU bookstore: €27.95.

### **Target group**

This course is only open to students of the two-year Master's programmes Drug Discovery & Safety and Physics of the Faculty of Sciences. 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.

### Remarks

- To do well, students are expected to attend all lessons. Group schedules are to be found at VUnet and 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 FEW programmes offering 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. If you decide to withdraw from the course, do so in time 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 [onderwijsbureau.beta@vu.nl](mailto:onderwijsbureau.beta@vu.nl).

## Signal Transduction in Health and Disease

<b>Course code</b>	X_432535 (432535)
<b>Period</b>	Period 2
<b>Credits</b>	6.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	prof. dr. M.J. Smit
<b>Examinator</b>	prof. dr. M.J. Smit
<b>Teaching method(s)</b>	Lecture
<b>Level</b>	600

### Course objective

At the end of this theoretical course, the students are aware of the latest insights of cellular signal transduction in both healthy and pathological conditions.

### Course content

This course will link human genetic variation (somatic and inherited mutations) to the development of disease and will focus on pathological signaling, mutant signaling proteins in disease and possible treatment of resulting disease (small compounds, biologicals, gene therapy). Modern pharmacological concepts, including constitutive receptor activity, receptor regulation, allosteric modulation and dimerization will be addressed in light of signal transduction in health and disease. A special focus will be on signal transduction resulting in pathologies such as Alzheimer, Parkinson's disease, inflammatory diseases and cancer.

### Form of tuition

Lectures, self-study.

Students will do a case study in groups on a receptor/protein family linked to disease. Molecular mechanisms underlying pathology will be addressed and presented.

**Type of assessment**

Assignment and presentation, written exam.

**Course reading**

'Cell signaling', Authors: Wendell Lim, Bruce Mayer, Tony Pawson

ISBN: 9780815342441

Format: Paperback

Publication Date: June 15, 2014

Papers available on Blackboard

**Recommended background knowledge**

Bachelor Biology, Medical Biology, Pharmaceutical Sciences, Medical Natural Sciences, Biomolecular Science portal course or equivalent

**Target group**

mBMS-BC, mDDS-BCCA, mDDS-CMCT, mDDS-DD&S, mDDS-DDSA, mDDS-DDTF, mDDS-C-var, mDDS-E-var, mDDS-M-var, mMNS-MCD, mMNS-MPy

**Specialisation**

<b>Course code</b>	O_MLVERD ()
<b>Period</b>	Period 2+3
<b>Credits</b>	3.0
<b>Faculty</b>	Fac. der Gedrags- en Bewegingswetensch.
<b>Coordinator</b>	dr. A. Handelzalts
<b>Examinator</b>	dr. A. Handelzalts
<b>Teaching staff</b>	drs. J.K.W. Riksen, drs. H.R. Goudsmit, drs. Y.G. Meindersma, drs. W.S. Hoekstra, drs. S. Donszelmann, dr. H.B. Westbroek, C.L. Geraedts, drs. A. Krijgsman, drs. K.L. Schaap, W. Maas, F.L. de Vries MSc, drs. H. Stouthart, drs. I. Pauw, drs. C.D.P. van Oeveren
<b>Teaching method(s)</b>	Seminar,
<b>Level</b>	500

**Supramolecular Chemistry and Nanomaterials**

<b>Course code</b>	X_435653 (435653)
<b>Period</b>	Period 1
<b>Credits</b>	6.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Teaching method(s)</b>	Lecture
<b>Level</b>	400

**Course content**

<http://studiegids.uva.nl/xmlpages/page/2015-2016/zoek-vak/vak/15036>

**Remarks**

This course is offered at the UvA. For more information contact: FNWI Education Service Centre, Science Park 904,

[servicedesk-esc-science@uva.nl](mailto:servicedesk-esc-science@uva.nl), +31 (0)20 525 7100.  
Enrolment via <https://m.sis.uva.nl/vakaanmelden> is required.

## Synthetic Approaches in Medicinal Chemistry

<b>Course code</b>	X_435685 (435685)
<b>Period</b>	Period 2
<b>Credits</b>	6.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. M. Wijtmans
<b>Examinator</b>	dr. M. Wijtmans
<b>Teaching staff</b>	prof. dr. I.J.P. de Esch, dr. M. Wijtmans
<b>Teaching method(s)</b>	Lecture
<b>Level</b>	500

### Course objective

To obtain detailed knowledge of vital organic reactions and synthetic strategies.

### Course content

Within a medicinal chemistry context, organic synthesis continues to play a vital role because it allows perceived organic molecules to actually be prepared. A medicinal chemist with thorough knowledge of the synthetic toolbox will be able to efficiently find his/her way to a target molecule.

First, a brief recap of some synthesis principles is offered. Then, the course will focus on the most important and generally used synthetic reactions. These include reactions of nucleophilic carbon intermediates, nucleophilic substitutions, electrophilic additions to carbon-carbon multiple bonds, reductions, oxidations, cycloadditions, aromatic substitution reactions, rearrangements, and reactions of transition metals as well as of Group I and II metals. Collectively, this course delivers the synthetic knowledge necessary for efficient synthesis of organic molecules. The dynamic character of the synthetic toolbox is

### Form of tuition

The "Flipped classroom method" is used.

This means that all lectures have been recorded (slides + audio) and need to be independently studied by the students (there are no regular classes). Rather, all contact hours are used for intensive problem solving sessions.

### Type of assessment

Written examination(s).

### Course reading

Carey, F.A., Sundberg, R.J., Advanced Organic Chemistry, Part B, 5th edition.

### Entry requirements

Basic knowledge of organic chemistry.



**Recommended background knowledge**

Knowledge of basic organic chemistry.

**Target group**

mDDS-DD&amp;S

**Registration procedure**

VUNet

## Teaching Assistant

<b>Course code</b>	X_432741 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	3.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. J.E. van Muijlwijk-Koezen
<b>Examinator</b>	prof. dr. ir. R.V.A. Orru
<b>Level</b>	400

## Teaching Assistant

<b>Course code</b>	X_432742 ()
<b>Period</b>	Ac. Year (September)
<b>Credits</b>	6.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. J.E. van Muijlwijk-Koezen
<b>Examinator</b>	prof. dr. ir. R.V.A. Orru
<b>Level</b>	400

## Teaching Methodology Chemistry I

<b>Course code</b>	O_MLVDSKI ()
<b>Period</b>	Period 1+2
<b>Credits</b>	3.0
<b>Language of tuition</b>	Dutch
<b>Faculty</b>	Fac. der Gedrags- en Bewegingswetensch.
<b>Coordinator</b>	dr. H.B. Westbroek
<b>Examinator</b>	dr. H.B. Westbroek
<b>Teaching staff</b>	dr. H.B. Westbroek, F.L. de Vries MSc
<b>Teaching method(s)</b>	Seminar
<b>Level</b>	500

## Teaching Methodology Chemistry II

<b>Course code</b>	O_MLVDSKII ()
<b>Period</b>	Period 1+2
<b>Credits</b>	6.0
<b>Faculty</b>	Fac. der Gedrags- en Bewegingswetensch.
<b>Coordinator</b>	dr. H.B. Westbroek
<b>Examinator</b>	dr. H.B. Westbroek
<b>Teaching staff</b>	dr. H.B. Westbroek, F.L. de Vries MSc
<b>Teaching method(s)</b>	Seminar
<b>Level</b>	500

## Teaching Practice I

<b>Course code</b>	O_MLPRAKI ()
<b>Period</b>	Period 1+2+3
<b>Credits</b>	15.0
<b>Faculty</b>	Fac. der Gedrags- en Bewegingswetensch.
<b>Coordinator</b>	ir. E.J.F. Scheringa
<b>Examinator</b>	ir. E.J.F. Scheringa
<b>Level</b>	500

## Teaching Practice II

<b>Course code</b>	O_MLPRAKII ()
<b>Period</b>	Period 1+2+3
<b>Credits</b>	15.0
<b>Faculty</b>	Fac. der Gedrags- en Bewegingswetensch.
<b>Coordinator</b>	ir. E.J.F. Scheringa
<b>Examinator</b>	ir. E.J.F. Scheringa
<b>Level</b>	500

## Tutoring Students

<b>Course code</b>	X_432625 (432625)
<b>Period</b>	Period 2
<b>Credits</b>	3.0
<b>Language of tuition</b>	English
<b>Faculty</b>	Faculteit der Exacte Wetenschappen
<b>Coordinator</b>	dr. M. Wijtmans
<b>Examinator</b>	dr. M. Wijtmans
<b>Teaching staff</b>	dr. M. Wijtmans, dr. H.B. Westbroek
<b>Teaching method(s)</b>	Lecture
<b>Level</b>	400

### **Course objective**

This course aims to prepare students for coaching tasks in tutorials and practical courses. Students will encounter aspects of teacher-student interaction, including several models that are involved in the coaching process.

### **Course content**

The course contains various topics and activities. Students make an analysis of various learning aims as well as prepare, conduct and reflect on a presentation of a pre and post discussion regarding tutorials and practical courses. They will observe and interpret the application of problem solving and coaching models in tutorials and practical courses. Attention will be paid to strengths and weaknesses in models of teacher-student interaction. An important constituent is the student's analysis of his/her own pattern of communication. Topics on safety and lab journal procedures in practical courses as well as on the grading of lab reports are also included.

### **Form of tuition**

4 consecutive hours per week (seven weeks long):

- Lectures
- Simulations
- Self-study
- Group work

### **Type of assessment**

- An essay on the strengths and weaknesses in a model of teacher-student interaction.
- A learning report on presentations concerning predict, observe, explain in practical work.
- A written analysis on grading lab reports.
- A written feedback on the planning of and enactment in tutorials.

### **Course reading**

Will be provided.

### **Target group**

mCh-AS, mCh-MDSC, mCh-MSP, mCh-SES, mDDS-BCCA, mDDS-CMCT, mDDS-DD&S, mDDS-DDSA, mDDS-DDTF

### **Registration procedure**

VUnet

### **Remarks**

This course is compulsory for MSc students who become assistants in practical courses and tutorials in the department of Chemistry and Pharmaceutical Sciences. Moreover, the course is recommendable for any MSc student who has a general interest in educational coaching strategies and models.

Number of participants is limited to 24 (first-come, first-serve basis).

Priority is given to MSc students. If any of the 24 seats are left, the course may also be accessible to 3rd year BSc students FAR en SK with a strong interest in educational aspects (first-come, first-serve basis). Interested BSc students should first contact Maikel Wijtmans ([m.wijtmans@vu.nl](mailto:m.wijtmans@vu.nl)).