



## Medical Natural Sciences MSc

Vrije Universiteit Amsterdam - Faculteit der Exacte Wetenschappen - M Medical Natural Sciences - 2014-2015

## Structure of the training

The Master's programme of Medical Natural Sciences offers three different variants for graduation:

- Research variants (O - variant)
  - Medical physics
  - Physics of Life
  - Molecular Clinical Diagnostics
  - Medical physiology
- Society oriented variant (M - variant)
- Communication variant (C - variant)
- Education variant (E - variant)

Schematic overview of the Master course Medical Natural sciences (in cp):

<b>Variant</b>	<b>O</b>	<b>M</b>	<b>C</b>	<b>E</b>
Compulsory courses (Major)	27, 30 or 36	18	18	18
Research project (Major)	39	30	30	30
Literature study	6 or 12	6	6	6
Minor programme (obligatory in O-variant)	21	-	-	-
Internship (e.g. at a company)	-	30	30	-
M or C projects	-	30	30	-
High school teacher education	-	-	-	60
Ethics	3	3	3	3
Writing a scientific article	3	3	3	3
Optional program O-variant, for example - Deficiency courses - Extension research project - Extension literature study - extra courses	12, 15 or 18			
<b>Total (cp)</b>	<b>120</b>	<b>120</b>	<b>120</b>	<b>120</b>

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## Communication variant

In addition to the courses below a total of at least 18 ECTS of track specific courses has to be chosen in consultation with the master coordinator.

Opleidingsdelen:

- [Courses for Communication Part](#)
- [MNS courses for C-E-M variant](#)

## Courses for Communication Part

To complete the Master programme (120 credits) of the Communication Variant, the student has to choose 60 credits Communication courses.

Opleidingsdelen:

- [Optional courses: select at least 12EC](#)
- [Compulsory Courses](#)

## Optional courses: select at least 12EC

Students can opt for a selection of modules from this group. The following modules are compulsory:

- Research Methods (AM\_470582)
- Science and Communication (AM\_470587)

Vakken:

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

## Compulsory Courses

Vakken:

Naam	Periode	Credits	Code
<a href="#">Internship Communication Specialisation</a>	Ac. Jaar (september)	30.0	AM_471148
<a href="#">Qualitative and Quantitative Research Methods</a>	Periode 1	6.0	AM_470582
<a href="#">Science and Communication</a>	Periode 1	6.0	AM_470587



## MNS courses for C-E-M variant

MNS courses for C-variant. 60 ec of MNS courses from the specialization has to be chosen in consultation with the master coordinator.

Opleidingsdelen:

- Courses in track Molecular Clinical Diagnostics (C, E or M-variant)
- Courses in track Medical Physics (C, E or M-variant)
- Courses in track Medical Physiology (C, E or M-variant)
- Courses in track Physics of Life (C, E or M-variant)
- Compulsory courses for all tracks

## Courses in track Molecular Clinical Diagnostics (C, E or M-variant)

Opleidingsdelen:

- Compulsory choice (18 ec track specific)
- Compulsory Courses

## Compulsory choice (18 ec track specific)

Vakken:

Naam	Periode	Credits	Code
<a href="#">Advanced Spectroscopy</a>	Periode 6	6.0	X_432767
<a href="#">Bio-analysis &amp; Clinical Diagnostics</a>	Periode 1	6.0	X_432765
<a href="#">Drug-induced Stress and Cellular Responses</a>	Periode 2	6.0	X_432536
<a href="#">Omics-procedures in molecular clinical Diagnostics</a>	Periode 5	6.0	X_432766
<a href="#">Pathophysiology of Heart and Circulation</a>	Periode 1	6.0	M_CPATHO09
<a href="#">Signal Transduction in Health and Disease</a>	Periode 2	6.0	X_432535

## Compulsory Courses

Vakken:

Naam	Periode	Credits	Code
<a href="#">Colloquium / Literature thesis MNS - Molecular Clinical Diagnostics</a>	Ac. Jaar (september)	6.0	X_432769

<a href="#">Master Project Molecular Clinical Diagnostics (for M,C,E-variant)</a>	Ac. Jaar (september)	30.0	X_432628
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## Courses in track Medical Physics (C, E or M-variant)

Opleidingsdelen:

- [Compulsary choice \(18 ec track specific\)](#)
- [Compulsory Courses](#)

### Compulsary choice (18 ec track specific)

Vakken:

Naam	Periode	Credits	Code
<a href="#">Advanced Medical Technology</a>	Periode 5	6.0	X_437026
<a href="#">Biomedical Modelling and Simulation</a>	Periode 1	6.0	X_430112
<a href="#">Biomedical Optics</a>	Periode 5	6.0	X_428529
<a href="#">Parameter Estimation Applied to Medical and Biological Sciences</a>	Periode 4	6.0	X_432631
<a href="#">Physics of Organs 1: Cardio-Pulmonary Physics</a>	Periode 1	6.0	X_428527
<a href="#">Physics of Organs 2: Sensory Organs and Bioelectricity</a>	Periode 2	6.0	X_428528
<a href="#">Soft Condensed Matter and Biological Physics</a>	Periode 2	6.0	X_420167

## Compulsory Courses

Vakken:

Naam	Periode	Credits	Code
<a href="#">Colloquium / Literature thesis MNS - Medical Physics</a>	Ac. Jaar (september)	6.0	X_432611
<a href="#">Master Project Medical Physics (M,C,E-var.)</a>	Ac. Jaar (september)	30.0	X_432627

## Courses in track Medical Physiology (C, E or M-variant)

Opleidingsdelen:

- Compulsary choice (18 ec track specific)
- Compulsory courses

## Compulsary choice (18 ec track specific)

Vakken:

Naam	Periode	Credits	Code
<a href="#">Advanced Cardiac Diagnostics</a>	Periode 3+4+5	3.0	M_CCARDIA09
<a href="#">Bio-analysis &amp; Clinical Diagnostics</a>	Periode 1	6.0	X_432765
<a href="#">Biomedical Modelling and Simulation</a>	Periode 1	6.0	X_430112
<a href="#">Drug-induced Stress and Cellular Responses</a>	Periode 2	6.0	X_432536
<a href="#">Pathophysiology of Heart and Circulation</a>	Periode 1	6.0	M_CPATHO09
<a href="#">Physics of Organs 1: Cardio-Pulmonary Physics</a>	Periode 1	6.0	X_428527
<a href="#">Signal Transduction in Health and Disease</a>	Periode 2	6.0	X_432535
<a href="#">Soft Condensed Matter and Biological Physics</a>	Periode 2	6.0	X_420167

## Compulsory courses

Vakken:

Naam	Periode	Credits	Code
<a href="#">Colloquium / Literature thesis MNS - Medical Physiology</a>	Ac. Jaar (september)	6.0	X_432613
<a href="#">Master Project Medical Physiology (M,C,E-var.)</a>	Ac. Jaar (september)	30.0	X_432626

## Courses in track Physics of Life (C, E or M-variant)

Opleidingsdelen:

- Compulsary choice (18 ec track specific)
- Compulsory Courses

## Compulsary choice (18 ec track specific)

Vakken:

Naam	Periode	Credits	Code
<a href="#">Biomedical Modelling and Simulation</a>	Periode 1	6.0	X_430112
<a href="#">Biomedical Optics</a>	Periode 5	6.0	X_428529
<a href="#">Biophotonics III: Practical Training</a>	Periode 3	3.0	AM_470630
<a href="#">Dynamics of Biomolecules and Cells</a>	Periode 4	6.0	X_422583
<a href="#">Lasers and Quantum Optics</a>	Periode 1	6.0	X_422539
<a href="#">Parameter Estimation Applied to Medical and Biological Sciences</a>	Periode 4	6.0	X_432631
<a href="#">Soft Condensed Matter and Biological Physics</a>	Periode 2	6.0	X_420167
<a href="#">Statistical Theory of Complex Molecular Systems</a>	Periode 1	6.0	X_428520

## Compulsory Courses

Vakken:

Naam	Periode	Credits	Code
<a href="#">Colloquium / Literature thesis MNS - Physics of Life</a>	Ac. Jaar (september)	6.0	X_432768
<a href="#">Master Project Physics of Life (M,C,E-var.)</a>	Ac. Jaar (september)	30.0	X_432629

## Compulsory courses for all tracks

Compulsory choice Ethics for all tracks. Choose one of two.

Vakken:

Naam	Periode	Credits	Code
<a href="#">Ethics in Medical Research</a>	Periode 3	3.0	X_422592
<a href="#">Scientific Writing in English for Medical Natural Sciences</a>	Periode 3	3.0	X_420563

## Education variant

In addition to the courses below a total of at least 18 ECTS of track specific courses has to be chosen in consultation with the master coordinator.

Opleidingsdelen:

- [Courses for Education Part](#)
- [MNS courses for C-E-M variant](#)

## Courses for Education Part

Opleidingsdelen:

- [Leraar voorbereidend hoger onderwijs in Natuurkunde verplicht](#)
- [Leraar voorbereidend hoger onderwijs in Scheikunde verplicht](#)

## Leraar voorbereidend hoger onderwijs in Natuurkunde verplicht

Vakken:

Naam	Periode	Credits	Code
<a href="#">Algemene didactiek en Pedagogiek I</a>	Periode 1+2, Periode 4+5	6.0	O_MLADEPI
<a href="#">Algemene Didactiek en Pedagogiek II</a>	Periode 1+2, Periode 4+5	3.0	O_MLADEPII
<a href="#">Praktijk I</a>	Periode 1+2+3, Periode 4+5+6	15.0	O_MLPRAKI
<a href="#">Praktijk II</a>	Periode 1+2+3, Periode 4+5+6	15.0	O_MLPRAKII
<a href="#">Professionele ontwikkeling en onderzoek I</a>	Periode 1+2+3, Periode 4+5+6	3.0	O_MLVPOOI
<a href="#">Professionele ontwikkeling en onderzoek II</a>	Periode 1+2+3, Periode 4+5+6	6.0	O_MLVPOOII
<a href="#">Vakdidactiek Natuurkunde I</a>	Periode 1+2, Periode 4+5	3.0	O_MLVDNAI
<a href="#">Vakdidactiek Natuurkunde II</a>	Periode 1+2, Periode 4+5	6.0	O_MLVDNAII
<a href="#">Verdieping</a>	Periode 2+3, Periode 5+6	3.0	O_MLVERD

## Leraar voorbereidend hoger onderwijs in Scheikunde verplicht

Vakken:

Naam	Periode	Credits	Code
<a href="#">Algemene didactiek en Pedagogiek I</a>	Periode 1+2, Periode 4+5	6.0	O_MLADEPI
<a href="#">Algemene Didactiek en Pedagogiek II</a>	Periode 1+2, Periode 4+5	3.0	O_MLADEPII

Praktijk I	Periode 1+2+3, Periode 4+5+6	15.0	O_MLPRAKI
Praktijk II	Periode 1+2+3, Periode 4+5+6	15.0	O_MLPRAKII
Professionele ontwikkeling en onderzoek I	Periode 1+2+3, Periode 4+5+6	3.0	O_MLVPOOI
Professionele ontwikkeling en onderzoek II	Periode 1+2+3, Periode 4+5+6	6.0	O_MLVPOOII
Vakdidactiek Scheikunde I	Periode 1+2, Periode 4+5	3.0	O_MLVDSKI
Vakdidactiek Scheikunde II	Periode 1+2, Periode 4+5	6.0	O_MLVDSKII
Verdieping	Periode 2+3, Periode 5+6	3.0	O_MLVERD

## MNS courses for C-E-M variant

MNS courses for C-variant. 60 ec of MNS courses from the specialization has to be chosen in consultation with the master coordinator.

Opleidingsdelen:

- Courses in track Molecular Clinical Diagnostics (C, E or M-variant)
- Courses in track Medical Physics (C, E or M-variant)
- Courses in track Medical Physiology (C, E or M-variant)
- Courses in track Physics of Life (C, E or M-variant)
- Compulsory courses for all tracks

## Courses in track Molecular Clinical Diagnostics (C, E or M-variant)

Opleidingsdelen:

- Compulsory choice (18 ec track specific)
- Compulsory Courses

## Compulsory choice (18 ec track specific)

Vakken:

Naam	Periode	Credits	Code
Advanced Spectroscopy	Periode 6	6.0	X_432767
Bio-analysis & Clinical Diagnostics	Periode 1	6.0	X_432765
Drug-induced Stress and Cellular Responses	Periode 2	6.0	X_432536
Omics-procedures in molecular clinical Diagnostics	Periode 5	6.0	X_432766
Pathophysiology of Heart and Circulation	Periode 1	6.0	M_CPATHO09
Signal Transduction in Health and Disease	Periode 2	6.0	X_432535

## Compulsory Courses

Vakken:

Naam	Periode	Credits	Code
<a href="#">Colloquium / Literature thesis MNS - Molecular Clinical Diagnostics</a>	Ac. Jaar (september)	6.0	X_432769
<a href="#">Master Project Molecular Clinical Diagnostics (for M,C,E-variant)</a>	Ac. Jaar (september)	30.0	X_432628

## Courses in track Medical Physics (C, E or M-variant)

Opleidingsdelen:

- [Compulsary choice \(18 ec track specific\)](#)
- [Compulsory Courses](#)

## Compulsary choice (18 ec track specific)

Vakken:

Naam	Periode	Credits	Code
<a href="#">Advanced Medical Technology</a>	Periode 5	6.0	X_437026
<a href="#">Biomedical Modelling and Simulation</a>	Periode 1	6.0	X_430112
<a href="#">Biomedical Optics</a>	Periode 5	6.0	X_428529
<a href="#">Parameter Estimation Applied to Medical and Biological Sciences</a>	Periode 4	6.0	X_432631
<a href="#">Physics of Organs 1: Cardio-Pulmonary Physics</a>	Periode 1	6.0	X_428527
<a href="#">Physics of Organs 2: Sensory Organs and Bioelectricity</a>	Periode 2	6.0	X_428528
<a href="#">Soft Condensed Matter and Biological Physics</a>	Periode 2	6.0	X_420167

## Compulsory Courses

Vakken:

Naam	Periode	Credits	Code
Colloquium / Literature thesis MNS - Medical Physics	Ac. Jaar (september)	6.0	X_432611
Master Project Medical Physics (M,C,E-var.)	Ac. Jaar (september)	30.0	X_432627

## Courses in track Medical Physiology (C, E or M-variant)

Opleidingsdelen:

- Compulsory choice (18 ec track specific)
- Compulsory courses

## Compulsory choice (18 ec track specific)

Vakken:

Naam	Periode	Credits	Code
Advanced Cardiac Diagnostics	Periode 3+4+5	3.0	M_CCARDIA09
Bio-analysis & Clinical Diagnostics	Periode 1	6.0	X_432765
Biomedical Modelling and Simulation	Periode 1	6.0	X_430112
Drug-induced Stress and Cellular Responses	Periode 2	6.0	X_432536
Pathophysiology of Heart and Circulation	Periode 1	6.0	M_CPATHO09
Physics of Organs 1: Cardio-Pulmonary Physics	Periode 1	6.0	X_428527
Signal Transduction in Health and Disease	Periode 2	6.0	X_432535
Soft Condensed Matter and Biological Physics	Periode 2	6.0	X_420167

## Compulsory courses

Vakken:

Naam	Periode	Credits	Code
Colloquium / Literature thesis MNS - Medical Physiology	Ac. Jaar (september)	6.0	X_432613
Master Project Medical Physiology (M,C,E-var.)	Ac. Jaar (september)	30.0	X_432626



## Courses in track Physics of Life (C, E or M-variant)

Opleidingsdelen:

- [Compulsary choice \(18 ec track specific\)](#)
- [Compulsory Courses](#)

### Compulsary choice (18 ec track specific)

Vakken:

Naam	Periode	Credits	Code
<a href="#">Biomedical Modelling and Simulation</a>	Periode 1	6.0	X_430112
<a href="#">Biomedical Optics</a>	Periode 5	6.0	X_428529
<a href="#">Biophotonics III: Practical Training</a>	Periode 3	3.0	AM_470630
<a href="#">Dynamics of Biomolecules and Cells</a>	Periode 4	6.0	X_422583
<a href="#">Lasers and Quantum Optics</a>	Periode 1	6.0	X_422539
<a href="#">Parameter Estimation Applied to Medical and Biological Sciences</a>	Periode 4	6.0	X_432631
<a href="#">Soft Condensed Matter and Biological Physics</a>	Periode 2	6.0	X_420167
<a href="#">Statistical Theory of Complex Molecular Systems</a>	Periode 1	6.0	X_428520

### Compulsory Courses

Vakken:

Naam	Periode	Credits	Code
<a href="#">Colloquium / Literature thesis MNS - Physics of Life</a>	Ac. Jaar (september)	6.0	X_432768
<a href="#">Master Project Physics of Life (M,C,E-var.)</a>	Ac. Jaar (september)	30.0	X_432629

### Compulsory courses for all tracks

Compulsory choice Ethics for all tracks. Choose one of two.

Vakken:

Naam	Periode	Credits	Code
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<a href="#">Ethics in Medical Research</a>	Periode 3	3.0	X_422592
<a href="#">Scientific Writing in English for Medical Natural Sciences</a>	Periode 3	3.0	X_420563

## Research Variant Medical Physics

In addition to the courses below a total of 12 ects is available for optional courses. These credit points can also be used to extend major project, minor project or literature study.

In case of deficiencies these courses are not optional but will be prescribed by the master coordinator.

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

Before starting the Major Research Project or the Minor Research Project at least half of the track specific courses have to be completed.

Master Coordinator:

Dr.ir. Th.J.C. Faes  
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Opleidingsdelen:

- [Minor Research Project MNS](#)
- [Optional courses \(18 ec compulsory\)](#)
- [Colloquium / Literature thesis \(1 out of 2\)](#)
- [Selective elective Courses](#)
- [Master Research Project MNS](#)
- [Compulsory Courses](#)
- [Compulory courses for all tracks](#)

## Minor Research Project MNS

The minor project can be chosen in any track. The minimum length is 21 ects. By using available free space this can be extended to 27 or 33 ec.

Vakken:

Naam	Periode	Credits	Code
<a href="#">Minor Research Project MNS Medical Physics</a>	Ac. Jaar (september)	27.0	X_432634
<a href="#">Minor Research Project MNS Medical Physics</a>	Ac. Jaar (september)	21.0	X_432708
<a href="#">Minor Research Project MNS Medical Physics</a>	Ac. Jaar (september)	33.0	X_432780
<a href="#">Minor Research Project MNS Medical Physiology</a>	Ac. Jaar (september)	33.0	X_432782
<a href="#">Minor Research Project MNS Medical Physiology</a>	Ac. Jaar (september)	21.0	X_432712

Minor Research Project MNS Medical Physiology	Ac. Jaar (september)	27.0	X_432713
Minor Research Project MNS Molecular Clinical Diagnostics	Ac. Jaar (september)	21.0	X_432710
Minor Research Project MNS Molecular Clinical Diagnostics	Ac. Jaar (september)	27.0	X_432711
Minor Research Project MNS Molecular Clinical Diagnostics	Ac. Jaar (september)	33.0	X_432781
Minor Research Project MNS Physics of Life	Ac. Jaar (september)	21.0	X_432709
Minor Research Project MNS Physics of Life	Ac. Jaar (september)	27.0	X_432717
Minor Research Project MNS Physics of Life	Ac. Jaar (september)	33.0	X_432783

## Optional courses (18 ec compulsory)

Students need to select a total of 18 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.

Vakken:

Naam	Periode	Credits	Code
Advanced Medical Technology	Periode 5	6.0	X_437026
Biomedical Optics	Periode 5	6.0	X_428529
Physics of Organs 2: Sensory Organs and Bioelectricity	Periode 2	6.0	X_428528
Soft Condensed Matter and Biological Physics	Periode 2	6.0	X_420167

## Colloquium / Literature thesis (1 out of 2)

Vakken:

Naam	Periode	Credits	Code
Colloquium / Literature thesis MNS - Medical Physics	Ac. Jaar (september)	6.0	X_432611
Colloquium / Literature thesis MNS - Medical Physics	Ac. Jaar (september)	12.0	X_432612

## Selective elective Courses

Compulsory courses at the expense of the optional courses unless the content has already been covered in the bachelor programme.

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.

Vakken:

Naam	Periode	Credits	Code
<a href="#">Colloquium / Literature thesis MNS - Medical Physiology</a>	Ac. Jaar (september)	6.0	X_432613
<a href="#">Colloquium / Literature thesis MNS - Molecular Clinical Diagnostics</a>	Ac. Jaar (september)	6.0	X_432769
<a href="#">Colloquium / Literature thesis MNS - Physics of Life</a>	Ac. Jaar (september)	6.0	X_432768
<a href="#">Differentiëren en integreren 3</a>	Periode 4	3.0	X_400577
<a href="#">Elektronica en signaalverwerking</a>	Periode 4	6.0	X_420533
<a href="#">Introductie Medische Beeldbewerking</a>	Periode 2	6.0	X_432630
<a href="#">Medical Imaging</a>	Periode 4	6.0	X_428526
<a href="#">Voortgezette Biostatistiek</a>	Periode 4	3.0	X_401078

## Master Research Project MNS

The minimum length for the major project is 39 ects. By using available free space this can be extended to 45 or 51 ec.

Vakken:

Naam	Periode	Credits	Code
<a href="#">Major Research Project MNS Medical Physics</a>	Ac. Jaar (september)	39.0	X_432593
<a href="#">Major Research Project MNS Medical Physics</a>	Ac. Jaar (september)	45.0	X_432772
<a href="#">Major Research Project MNS Medical Physics</a>	Ac. Jaar (september)	51.0	X_432773

## Compulsory Courses

Vakken:

Naam	Periode	Credits	Code
<a href="#">Biomedical Modelling and Simulation</a>	Periode 1	6.0	X_430112
<a href="#">Parameter Estimation Applied to Medical and Biological Sciences</a>	Periode 4	6.0	X_432631
<a href="#">Physics of Organs 1: Cardio-Pulmonary Physics</a>	Periode 1	6.0	X_428527

## Compulsory courses for all tracks

Compulsory choice Ethics for all tracks. Choose one of two.

Vakken:

Naam	Periode	Credits	Code
<a href="#">Ethics in Medical Research</a>	Periode 3	3.0	X_422592
<a href="#">Scientific Writing in English for Medical Natural Sciences</a>	Periode 3	3.0	X_420563

## Research Variant Physics of Life

In addition to the courses below a total of 12 ects is available for optional courses. In case of deficiencies these courses are not optional but will be prescribed by the master coordinator.

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

Before starting the Major Research Project or the Minor Research Project at least half of the track specific courses have to be completed.

Master Coordinator:

Physics of Life  
Master coordinator

Dr. S.M. Witte (VU)  
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Opleidingsdelen:

- [Minor Research Project MNS](#)
- [Optional courses \(12 ec compulsory\)](#)
- [Colloquium / Literature thesis MNS](#)
- [Aangeraden keuzevakken](#)
- [Master Research Project MNS](#)
- [Compulsory Courses PoL](#)
- [Compulsory courses for all tracks](#)

## Minor Research Project MNS

The minor project can be chosen in any track. The minimum length is 21 ec's. By using available free space this can be extended to 27 or 33 ec.

Vakken:

Naam	Periode	Credits	Code
<a href="#">Minor Research Project MNS Medical Physics</a>	Ac. Jaar (september)	27.0	X_432634
<a href="#">Minor Research Project MNS Medical Physics</a>	Ac. Jaar (september)	21.0	X_432708
<a href="#">Minor Research Project MNS Medical Physics</a>	Ac. Jaar (september)	33.0	X_432780
<a href="#">Minor Research Project MNS Medical Physiology</a>	Ac. Jaar (september)	33.0	X_432782
<a href="#">Minor Research Project MNS Medical Physiology</a>	Ac. Jaar (september)	21.0	X_432712
<a href="#">Minor Research Project MNS Medical Physiology</a>	Ac. Jaar (september)	27.0	X_432713
<a href="#">Minor Research Project MNS Molecular Clinical Diagnostics</a>	Ac. Jaar (september)	21.0	X_432710
<a href="#">Minor Research Project MNS Molecular Clinical Diagnostics</a>	Ac. Jaar (september)	27.0	X_432711
<a href="#">Minor Research Project MNS Molecular Clinical Diagnostics</a>	Ac. Jaar (september)	33.0	X_432781
<a href="#">Minor Research Project MNS Physics of Life</a>	Ac. Jaar (september)	21.0	X_432709
<a href="#">Minor Research Project MNS Physics of Life</a>	Ac. Jaar (september)	27.0	X_432717
<a href="#">Minor Research Project MNS Physics of Life</a>	Ac. Jaar (september)	33.0	X_432783

## Optional courses (12 ec compulsory)

Students need to select a total of 12 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.

Vakken:

Naam	Periode	Credits	Code
<a href="#">Biomedical Optics</a>	Periode 5	6.0	X_428529

Biophotonics III: Practical Training	Periode 3	3.0	AM_470630
Lasers and Quantum Optics	Periode 1	6.0	X_422539
Parameter Estimation Applied to Medical and Biological Sciences	Periode 4	6.0	X_432631
Statistical Theory of Complex Molecular Systems	Periode 1	6.0	X_428520

## Colloquium / Literature thesis MNS

The minimum length of colloquium/literature study is 6 ec in Physics of Life. By using available free space this can be extended to 12 ec in Physics of Life. If 6 ec is chosen it is possible to choose an extra colloquium/literature study of 6 ec in any other track.

Vakken:

Naam	Periode	Credits	Code
Colloquium / Literature thesis MNS - Physics of Life	Ac. Jaar (september)	6.0	X_432768
Colloquium / Literature thesis MNS - Physics of Life	Ac. Jaar (september)	12.0	X_432770

## Aangeraden keuzevakken

Compulsory courses at the expense of the optional courses unless the content has already been covered in the bachelor programme.

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.

Vakken:

Naam	Periode	Credits	Code
Biophotonics I: Microspectroscopy	Periode 3	3.0	AM_470629
Colloquium / Literature thesis MNS - Medical Physics	Ac. Jaar (september)	6.0	X_432611
Colloquium / Literature thesis MNS - Medical Physiology	Ac. Jaar (september)	6.0	X_432613
Colloquium / Literature thesis MNS - Molecular Clinical Diagnostics	Ac. Jaar (september)	6.0	X_432769
Differentiëren en integreren 3	Periode 4	3.0	X_400577
Introductie Medische Beeldbewerking	Periode 2	6.0	X_432630

## Master Research Project MNS

The minimum length for the major project is 39 ects. By using available free space this can be extended to 45 or 51 ec.

Vakken:

Naam	Periode	Credits	Code
<a href="#">Major Research Project MNS Physics of Life</a>	Ac. Jaar (september)	39.0	X_432716
<a href="#">Major Research Project MNS Physics of Life</a>	Ac. Jaar (september)	45.0	X_432774
<a href="#">Major Research Project MNS Physics of Life</a>	Ac. Jaar (september)	51.0	X_432775

## Compulsory Courses PoL

Vakken:

Naam	Periode	Credits	Code
<a href="#">Biomedical Modelling and Simulation</a>	Periode 1	6.0	X_430112
<a href="#">Dynamics of Biomolecules and Cells</a>	Periode 4	6.0	X_422583
<a href="#">Soft Condensed Matter and Biological Physics</a>	Periode 2	6.0	X_420167

## Compulsory courses for all tracks

Compulsory choice Ethics for all tracks. Choose one of two.

Vakken:

Naam	Periode	Credits	Code
<a href="#">Ethics in Medical Research</a>	Periode 3	3.0	X_422592
<a href="#">Scientific Writing in English for Medical Natural Sciences</a>	Periode 3	3.0	X_420563

## Research Variant Molecular Clinical Diagnostics

In addition to the courses below a total of 12 ects is available for optional courses. In case of deficiencies these courses are not optional but will be prescribed by the master coordinator.

Every programme, including the choice of optional courses, has to be discussed and agreed upon with the master coordinator and approved by



the Examination Board.

Before starting the Major Research Project or the Minor Research Project at least half of the track specific courses have to be completed.

Master Coordinator:

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Opleidingsdelen:

- [Colloquium / Literature Thesis, 12 e](#)
- [Minor Research Project MNS](#)
- [Optional courses](#)
- [Colloquium / Literature thesis MNS](#)
- [Recommended Optional Courses](#)
- [Master Research Project MNS](#)
- [Compulsory Courses](#)
- [Compulory courses for all tracks](#)

## Colloquium / Literature Thesis, 12 e

Compulsory choice: 1 out of 6

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.

Vakken:

Naam	Periode	Credits	Code
<a href="#">Colloquium / Literature thesis Medical Natural Sciences - Analytische Chemie en Toegepaste Spectroscopie</a>	Ac. Jaar (september)	12.0	X_432606
<a href="#">Colloquium / Literature thesis Medical Natural Sciences - Biofysica</a>	Ac. Jaar (september)	12.0	X_432608
<a href="#">Colloquium / Literature thesis Medical Natural Sciences - Fysica van complexe systemen</a>	Ac. Jaar (september)	12.0	X_432610
<a href="#">Colloquium / Literature thesis Medical Natural Sciences - Vumc-klinische chemie</a>	Ac. Jaar (september)	12.0	X_432604
<a href="#">Colloquium / Literature thesis MNS - Medical Physics</a>	Ac. Jaar (september)	12.0	X_432612
<a href="#">Colloquium / Literature thesis MNS - Medical Physiology</a>	Ac. Jaar (september)	12.0	X_432614

## Minor Research Project MNS

The minor project can be chosen in any track. The minimum length is 21 ec's. By using available free space this can be extended to 27 or 33 ec.

Vakken:

Naam	Periode	Credits	Code
<a href="#">Minor Research Project MNS Medical Physics</a>	Ac. Jaar (september)	27.0	X_432634
<a href="#">Minor Research Project MNS Medical Physics</a>	Ac. Jaar (september)	21.0	X_432708
<a href="#">Minor Research Project MNS Medical Physics</a>	Ac. Jaar (september)	33.0	X_432780
<a href="#">Minor Research Project MNS Medical Physiology</a>	Ac. Jaar (september)	33.0	X_432782
<a href="#">Minor Research Project MNS Medical Physiology</a>	Ac. Jaar (september)	21.0	X_432712
<a href="#">Minor Research Project MNS Medical Physiology</a>	Ac. Jaar (september)	27.0	X_432713
<a href="#">Minor Research Project MNS Molecular Clinical Diagnostics</a>	Ac. Jaar (september)	21.0	X_432710
<a href="#">Minor Research Project MNS Molecular Clinical Diagnostics</a>	Ac. Jaar (september)	27.0	X_432711
<a href="#">Minor Research Project MNS Molecular Clinical Diagnostics</a>	Ac. Jaar (september)	33.0	X_432781
<a href="#">Minor Research Project MNS Physics of Life</a>	Ac. Jaar (september)	21.0	X_432709
<a href="#">Minor Research Project MNS Physics of Life</a>	Ac. Jaar (september)	27.0	X_432717
<a href="#">Minor Research Project MNS Physics of Life</a>	Ac. Jaar (september)	33.0	X_432783

## Optional courses

Compulsory choice of at least 12 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.

Vakken:

Naam	Periode	Credits	Code
<a href="#">Advanced Spectroscopy</a>	Periode 6	6.0	X_432767

<a href="#">Drug-induced Stress and Cellular Responses</a>	Periode 2	6.0	X_432536
<a href="#">Pathophysiology of Heart and Circulation</a>	Periode 1	6.0	M_CPATHO09
<a href="#">Signal Transduction in Health and Disease</a>	Periode 2	6.0	X_432535

## Colloquium / Literature thesis MNS

A colloquium/literature study of 6 ec or 12 ec in Molecular Clinical Diagnostics is compulsory. If 6 ec is chosen an extra colloquium /literature study of 6 ec in any other track is required.

Opleidingsdelen:

- [Colloquium / Literature thesis \(1 out of 2\)](#)
- [Compulsory choice Colloquium / Literature study \(extension to 12 ec\)](#)

## Colloquium / Literature thesis (1 out of 2)

Vakken:

Naam	Periode	Credits	Code
<a href="#">Colloquium / Literature thesis MNS - Molecular Clinical Diagnostics</a>	Ac. Jaar (september)	6.0	X_432769
<a href="#">Colloquium / Literature thesis MNS - Molecular Clinical Diagnostics</a>	Ac. Jaar (september)	12.0	X_432771

## Compulsory choice Colloquium / Literature study (extension to 12 ec)

Only compulsory if a 6 ec Colloquium / Literature study is chosen in Molecular Clinical Diagnostics

Vakken:

Naam	Periode	Credits	Code
<a href="#">Colloquium / Literature thesis MNS - Medical Physics</a>	Ac. Jaar (september)	6.0	X_432611
<a href="#">Colloquium / Literature thesis MNS - Medical Physiology</a>	Ac. Jaar (september)	6.0	X_432613
<a href="#">Colloquium / Literature thesis MNS - Physics of Life</a>	Ac. Jaar (september)	6.0	X_432768

## Recommended Optional Courses

Compulsory courses at the expense of the optional courses unless the content has already been covered in the bachelor programme.

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.

Vakken:

Naam	Periode	Credits	Code
<a href="#">Inleiding systeembio</a>	Periode 4	3.0	X_401042
<a href="#">Voortgezette Biostatistiek</a>	Periode 4	3.0	X_401078

## Master Research Project MNS

The minimum length for the major project is 39 ects. By using available free space this can be extended to 45 or 51 ec.

Vakken:

Naam	Periode	Credits	Code
<a href="#">MNS Major Research Project Molecular Clinical Diagnostics</a>	Ac. Jaar (september)	39.0	X_432715
<a href="#">MNS Major Research Project Molecular Clinical Diagnostics</a>	Ac. Jaar (september)	45.0	X_432776
<a href="#">MNS Major Research Project Molecular Clinical Diagnostics</a>	Ac. Jaar (september)	51.0	X_432777

## Compulsory Courses

Vakken:

Naam	Periode	Credits	Code
<a href="#">Bio-analysis &amp; Clinical Diagnostics</a>	Periode 1	6.0	X_432765
<a href="#">Omics-procedures in molecular clinical Diagnostics</a>	Periode 5	6.0	X_432766

## Compulsory courses for all tracks

Compulsory choice Ethics for all tracks. Choose one of two.

Vakken:

Naam	Periode	Credits	Code
<a href="#">Ethics in Medical Research</a>	Periode 3	3.0	X_422592
<a href="#">Scientific Writing in English for Medical Natural Sciences</a>	Periode 3	3.0	X_420563

## Research Variant Medical Physiology

Opleidingsdelen:

- [Minor Research Project MNS](#)
- [Optional courses \(18 ec compulsory\)](#)
- [Colloquium / Literature thesis MNS](#)
- [Deficientievakken](#)
- [Master Research Project MNS](#)
- [Compulsory Courses](#)
- [Compulory courses for all tracks](#)

## Minor Research Project MNS

The minor project can be chosen in any track. The minimum length is 21 ec's. By using available free space this can be extended to 27 or 33 ec.

Vakken:

Naam	Periode	Credits	Code
<a href="#">Minor Research Project MNS Medical Physics</a>	Ac. Jaar (september)	27.0	X_432634
<a href="#">Minor Research Project MNS Medical Physics</a>	Ac. Jaar (september)	21.0	X_432708
<a href="#">Minor Research Project MNS Medical Physics</a>	Ac. Jaar (september)	33.0	X_432780
<a href="#">Minor Research Project MNS Medical Physiology</a>	Ac. Jaar (september)	33.0	X_432782
<a href="#">Minor Research Project MNS Medical Physiology</a>	Ac. Jaar (september)	21.0	X_432712
<a href="#">Minor Research Project MNS Medical Physiology</a>	Ac. Jaar (september)	27.0	X_432713
<a href="#">Minor Research Project MNS Molecular Clinical Diagnostics</a>	Ac. Jaar (september)	21.0	X_432710
<a href="#">Minor Research Project MNS Molecular Clinical Diagnostics</a>	Ac. Jaar (september)	27.0	X_432711
<a href="#">Minor Research Project MNS Molecular Clinical Diagnostics</a>	Ac. Jaar (september)	33.0	X_432781
<a href="#">Minor Research Project MNS Physics of Life</a>	Ac. Jaar (september)	21.0	X_432709
<a href="#">Minor Research Project MNS Physics of Life</a>	Ac. Jaar (september)	27.0	X_432717

<a href="#">Minor Research Project MNS Physics of Life</a>	Ac. Jaar (september)	33.0	X_432783
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## Optional courses (18 ec compulsory)

Compulsory choice of at least 18 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.

Vakken:

Naam	Periode	Credits	Code
<a href="#">Advanced Cardiac Diagnostics</a>	Periode 3+4+5	3.0	M_CCARDIA09
<a href="#">Bio-analysis &amp; Clinical Diagnostics</a>	Periode 1	6.0	X_432765
<a href="#">Drug-induced Stress and Cellular Responses</a>	Periode 2	6.0	X_432536
<a href="#">Pathofysiologie van hart en circulatie</a>	Periode 5	6.0	AB_1015
<a href="#">Signal Transduction in Health and Disease</a>	Periode 2	6.0	X_432535
<a href="#">Soft Condensed Matter and Biological Physics</a>	Periode 2	6.0	X_420167

## Colloquium / Literature thesis MNS

A colloquium/literature study of 6 ec or 12 ec in Medical Physiology is compulsory. If 6 ec is chosen an extra colloquium /literature study of 6 ec in any other track is required.

Opleidingsdelen:

- [Colloquium / Literature thesis \(1 out of 2\)](#)
- [Compulsory choice Colloquium / Literature study \(extension to 12 ec\)](#)

## Colloquium / Literature thesis (1 out of 2)

Vakken:

Naam	Periode	Credits	Code
<a href="#">Colloquium / Literature thesis MNS - Medical Physiology</a>	Ac. Jaar (september)	6.0	X_432613
<a href="#">Colloquium / Literature thesis MNS - Medical Physiology</a>	Ac. Jaar (september)	12.0	X_432614

## Compulsory choice Colloquium / Literature study (extension to 12 ec)

Only compulsory if a 6 ec Colloquium / Literature study is chosen in Medical Physiology

Vakken:

Naam	Periode	Credits	Code
<a href="#">Colloquium / Literature thesis MNS - Medical Physics</a>	Ac. Jaar (september)	6.0	X_432611
<a href="#">Colloquium / Literature thesis MNS - Molecular Clinical Diagnostics</a>	Ac. Jaar (september)	6.0	X_432769
<a href="#">Colloquium / Literature thesis MNS - Physics of Life</a>	Ac. Jaar (september)	6.0	X_432768

## Deficientievakken

Compulsory courses at the expense of the optional courses unless the content has already been covered in the bachelor programme.

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.

Vakken:

Naam	Periode	Credits	Code
<a href="#">Inleiding systeembio</a>	Periode 4	3.0	X_401042
<a href="#">Voortgezette Biostatistiek</a>	Periode 4	3.0	X_401078

## Master Research Project MNS

The minimum length for the major project is 39 ec's. By using available free space this can be extended to 45 or 51 ec's.

Vakken:

Naam	Periode	Credits	Code
<a href="#">Major Research Project MNS Medical Physiology</a>	Ac. Jaar (september)	39.0	X_432714
<a href="#">Major Research Project MNS Medical Physiology</a>	Ac. Jaar (september)	45.0	X_432778
<a href="#">Major Research Project MNS Medical Physiology</a>	Ac. Jaar (september)	51.0	X_432779

## Compulsory Courses

Vakken:

Naam	Periode	Credits	Code
<a href="#">Pathophysiology of Heart and Circulation</a>	Periode 1	6.0	M_CPATHO09
<a href="#">Physics of Organs 1: Cardio-Pulmonary Physics</a>	Periode 1	6.0	X_428527

## Compulsory courses for all tracks

Compulsory choice Ethics for all tracks. Choose one of two.

Vakken:

Naam	Periode	Credits	Code
<a href="#">Ethics in Medical Research</a>	Periode 3	3.0	X_422592
<a href="#">Scientific Writing in English for Medical Natural Sciences</a>	Periode 3	3.0	X_420563

## Society Oriented Variant for Medical Natural Sciences

In addition to the courses below a total of at least 18 ECTS of track specific courses has to be chosen in consultation with the master coordinator.

Opleidingsdelen:

- [Courses for Society Oriented Part](#)
- [MNS courses for C-E-M variant](#)

## Courses for Society Oriented Part

To complete the Master programme (120 credits) of the Society Oriented Variant, the student has to choose 60 credits Society Oriented courses.

Opleidingsdelen:

- [MSc Biology Science in Society specialisation](#)

## MSc Biology Science in Society specialisation

The Master's graduate with a Science in society specialization combines an academic approach with the skills and competences that will allow him or her to perform scientific research at the interface of the biomedical sciences and society. The specialization aims to develop strategies that contribute to an understanding of complex societal problems and strategies to solve complex societal problems through interdisciplinary



research. In addition, the programme analyses the social, economic and ethical aspects of new developments in the biological sciences, so as to assess their implications for society. Master's graduates have the necessary skills to collaborate and communicate with researchers from various scientific disciplines (including but not limited to those in the biological sciences) and societal actors, and the ability to use these academic insights.

The Science in Society specialization has a study load of 54 EC.

Opleidingsdelen:

- [Compulsory courses](#)
- [Compulsory choice of at least 6 EC](#)

## Compulsory courses

Vakken:

Naam	Periode	Credits	Code
<a href="#">Analysis of Governmental Policy</a>	Periode 1	6.0	AM_470571
<a href="#">Communication, Organization and Management</a>	Periode 2	6.0	AM_470572
<a href="#">Internship Science in Society (BIO)</a>	Ac. Jaar (september)	30.0	AM_1134
<a href="#">Qualitative and Quantitative Research Methods</a>	Periode 1	6.0	AM_470582

## Compulsory choice of at least 6 EC

Vakken:

Naam	Periode	Credits	Code
<a href="#">Business Management in Health and Life Sciences</a>	Periode 2	6.0	AM_470584
<a href="#">Clinical development and clinical trials</a>	Periode 3	6.0	AM_470585
<a href="#">Disability and Development</a>	Periode 2	6.0	AM_470588
<a href="#">Entrepreneurship in Health and Life Sciences</a>	Periode 2	6.0	AM_470575
<a href="#">Health, Globalisation and Human Rights</a>	Periode 2	6.0	AM_470818
<a href="#">Policy, Politics and Participation</a>	Periode 2	6.0	AM_470589
<a href="#">Science in Dialogue</a>	Periode 2	6.0	AM_1002

## MNS courses for C-E-M variant

MNS courses for C-variant. 60 ec of MNS courses from the specialization has to be chosen in consultation with the master coordinator.

Opleidingsdelen:

- Courses in track Molecular Clinical Diagnostics (C, E or M-variant)
- Courses in track Medical Physics (C, E or M-variant)
- Courses in track Medical Physiology (C, E or M-variant)
- Courses in track Physics of Life (C, E or M-variant)
- Compulsory courses for all tracks

### Courses in track Molecular Clinical Diagnostics (C, E or M-variant)

Opleidingsdelen:

- Compulsory choice (18 ec track specific)
- Compulsory Courses

### Compulsory choice (18 ec track specific)

Vakken:

Naam	Periode	Credits	Code
<a href="#">Advanced Spectroscopy</a>	Periode 6	6.0	X_432767
<a href="#">Bio-analysis &amp; Clinical Diagnostics</a>	Periode 1	6.0	X_432765
<a href="#">Drug-induced Stress and Cellular Responses</a>	Periode 2	6.0	X_432536
<a href="#">Omics-procedures in molecular clinical Diagnostics</a>	Periode 5	6.0	X_432766
<a href="#">Pathophysiology of Heart and Circulation</a>	Periode 1	6.0	M_CPATHO09
<a href="#">Signal Transduction in Health and Disease</a>	Periode 2	6.0	X_432535

### Compulsory Courses

Vakken:

Naam	Periode	Credits	Code
<a href="#">Colloquium / Literature thesis MNS - Molecular Clinical Diagnostics</a>	Ac. Jaar (september)	6.0	X_432769

<a href="#">Master Project Molecular Clinical Diagnostics (for M,C,E-variant)</a>	Ac. Jaar (september)	30.0	X_432628
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## Courses in track Medical Physics (C, E or M-variant)

Opleidingsdelen:

- [Compulsary choice \(18 ec track specific\)](#)
- [Compulsory Courses](#)

### Compulsary choice (18 ec track specific)

Vakken:

Naam	Periode	Credits	Code
<a href="#">Advanced Medical Technology</a>	Periode 5	6.0	X_437026
<a href="#">Biomedical Modelling and Simulation</a>	Periode 1	6.0	X_430112
<a href="#">Biomedical Optics</a>	Periode 5	6.0	X_428529
<a href="#">Parameter Estimation Applied to Medical and Biological Sciences</a>	Periode 4	6.0	X_432631
<a href="#">Physics of Organs 1: Cardio-Pulmonary Physics</a>	Periode 1	6.0	X_428527
<a href="#">Physics of Organs 2: Sensory Organs and Bioelectricity</a>	Periode 2	6.0	X_428528
<a href="#">Soft Condensed Matter and Biological Physics</a>	Periode 2	6.0	X_420167

## Compulsory Courses

Vakken:

Naam	Periode	Credits	Code
<a href="#">Colloquium / Literature thesis MNS - Medical Physics</a>	Ac. Jaar (september)	6.0	X_432611
<a href="#">Master Project Medical Physics (M,C,E-var.)</a>	Ac. Jaar (september)	30.0	X_432627

## Courses in track Medical Physiology (C, E or M-variant)

Opleidingsdelen:

- Compulsary choice (18 ec track specific)
- Compulsory courses

## Compulsary choice (18 ec track specific)

Vakken:

Naam	Periode	Credits	Code
<a href="#">Advanced Cardiac Diagnostics</a>	Periode 3+4+5	3.0	M_CCARDIA09
<a href="#">Bio-analysis &amp; Clinical Diagnostics</a>	Periode 1	6.0	X_432765
<a href="#">Biomedical Modelling and Simulation</a>	Periode 1	6.0	X_430112
<a href="#">Drug-induced Stress and Cellular Responses</a>	Periode 2	6.0	X_432536
<a href="#">Pathophysiology of Heart and Circulation</a>	Periode 1	6.0	M_CPATHO09
<a href="#">Physics of Organs 1: Cardio-Pulmonary Physics</a>	Periode 1	6.0	X_428527
<a href="#">Signal Transduction in Health and Disease</a>	Periode 2	6.0	X_432535
<a href="#">Soft Condensed Matter and Biological Physics</a>	Periode 2	6.0	X_420167

## Compulsory courses

Vakken:

Naam	Periode	Credits	Code
<a href="#">Colloquium / Literature thesis MNS - Medical Physiology</a>	Ac. Jaar (september)	6.0	X_432613
<a href="#">Master Project Medical Physiology (M,C,E-var.)</a>	Ac. Jaar (september)	30.0	X_432626

## Courses in track Physics of Life (C, E or M-variant)

Opleidingsdelen:

- Compulsary choice (18 ec track specific)
- Compulsory Courses

## Compulsary choice (18 ec track specific)

Vakken:

Naam	Periode	Credits	Code
<a href="#">Biomedical Modelling and Simulation</a>	Periode 1	6.0	X_430112
<a href="#">Biomedical Optics</a>	Periode 5	6.0	X_428529
<a href="#">Biophotonics III: Practical Training</a>	Periode 3	3.0	AM_470630
<a href="#">Dynamics of Biomolecules and Cells</a>	Periode 4	6.0	X_422583
<a href="#">Lasers and Quantum Optics</a>	Periode 1	6.0	X_422539
<a href="#">Parameter Estimation Applied to Medical and Biological Sciences</a>	Periode 4	6.0	X_432631
<a href="#">Soft Condensed Matter and Biological Physics</a>	Periode 2	6.0	X_420167
<a href="#">Statistical Theory of Complex Molecular Systems</a>	Periode 1	6.0	X_428520

## Compulsory Courses

Vakken:

Naam	Periode	Credits	Code
<a href="#">Colloquium / Literature thesis MNS - Physics of Life</a>	Ac. Jaar (september)	6.0	X_432768
<a href="#">Master Project Physics of Life (M,C,E-var.)</a>	Ac. Jaar (september)	30.0	X_432629

## Compulsory courses for all tracks

Compulsory choice Ethics for all tracks. Choose one of two.

Vakken:

Naam	Periode	Credits	Code
<a href="#">Ethics in Medical Research</a>	Periode 3	3.0	X_422592
<a href="#">Scientific Writing in English for Medical Natural Sciences</a>	Periode 3	3.0	X_420563

## Advanced Cardiac Diagnostics

<b>Vakcode</b>	M_CCARDIA09 (3120004)
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<b>Periode</b>	Periode 3+4+5
<b>Credits</b>	3.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	VUmc
<b>Coördinator</b>	dr. O. Kamp
<b>Examinator</b>	dr. O. Kamp
<b>Lesmethode(n)</b>	Hoorcollege, Werkgroep
<b>Niveau</b>	500

### Doel vak

This course focuses on an update in different cardiac image modalities to quantify myocardial perfusion and myocardial function in coronary artery disease and cardiomyopathy.

### Inhoud vak

- MRI, PET/CT, Intracoronary FFR/CFR
- Echocardiography diagnostic and therapeutic
- Cardiac Resynchronisation Therapy and Two Stage procedure
- Literature study

### Toetsvorm

Written exam. In addition, students will receive their credits only when they have participated in the classes and also have fulfilled all requirements.

### Literatuur

Syllabus including relevant articles.

### Intekenprocedure

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

## Advanced Medical Technology

<b>Vakcode</b>	X_437026 (437026)
<b>Periode</b>	Periode 5
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	prof. dr. ir. R.M. Verdaasdonk
<b>Examinator</b>	prof. dr. ir. R.M. Verdaasdonk
<b>Docent(en)</b>	prof. dr. ir. R.M. Verdaasdonk
<b>Lesmethode(n)</b>	Hoorcollege
<b>Niveau</b>	400

### Doel vak

Understanding the physical principles of medical equipment in view of a safe and effective application.

### Inhoud vak

The course consists of an overview of various medical devices discussing the physical principles and mechanism of action when used with a patient. The understanding of the physics contributes to the safety of the patient and the way the device can be applied most optimally. Particular devices will be discussed like electro-surgery, lasers, ultrasonic knives, endoscopes, etc. Also recent research and new developments of instruments will be shown.

### Onderwijsvorm

Combination of lectures, practical hands-on with medical equipment, short projects of practical and literature research, oral project presentations.

### Overige informatie

Students should also register in advance for this course on Blackboard.

## Advanced Spectroscopy

<b>Vakcode</b>	X_432767 ()
<b>Periode</b>	Periode 6
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	dr. F. Ariese
<b>Examinator</b>	dr. F. Ariese
<b>Docent(en)</b>	dr. F. Ariese
<b>Lesmethode(n)</b>	Hoorcollege
<b>Niveau</b>	500

### Doel vak

To acquire a deeper insight into the basic principles and modern developments of molecular spectroscopy in (bio)analytical chemistry, with emphasis on fluorescence/luminescence and Raman techniques. To become familiar with recent literature on the use of these techniques in a variety of applications. To acquire practical skills in modern (laser) spectroscopy.

### Inhoud vak

The topics discussed comprise the basic principles of fluorescence/phosphorescence and Raman spectroscopy. Attention will be given to energy transfer mechanisms and the use of fluorescent probes, high-resolution fluorescence at cryogenic temperatures, single-molecule spectroscopy and coupling to analytical separation techniques. Raman spectroscopic topics will include surface-enhanced Raman, resonance Raman, time-resolved Raman and non-linear Raman techniques. Instrumental aspects, such as laser excitation, time-resolved detection, polarization and imaging will also be covered in this course. Recent examples of the use of these techniques in a chemistry, medical, environmental, industrial, forensic or space research context will be discussed on the basis of literature presentations by the students. The course also includes a set of fluorescence and Raman experiments at VU LaserLaB

### Onderwijsvorm

Lectures, tutorials

In small groups the students will carry out a set of experiments, of which the results will be laid down in a report and an oral presentation.

The students will also prepare a presentation on a recent literature article, to be given and discussed in class.

### Toetsvorm

The final grade will be determined based on

Experiment report (1/6)

Experiment presentation (1/6)

Literature presentation (1/6)

Written exam (3/6)

### Literatuur

Handouts and literature articles will be provided by the lecturer

### Aanbevolen voorkennis

Background knowledge of molecular spectroscopic techniques, in particular fluorescence and Raman, is expected (for instance MSc Chem course (bio)molecular spectroscopy or 3MNW/2N course Microscopy and Spectroscopy). When in doubt please contact the lecturer.

### Doelgroep

MSc Chemistry, MSc Medical Natural Sciences

## Algemene didactiek en Pedagogiek I

<b>Vakcode</b>	O_MLADEPI ()
<b>Periode</b>	Periode 1+2, Periode 4+5
<b>Credits</b>	6.0
<b>Voertaal</b>	Nederlands
<b>Faculteit</b>	Faculteit der Psychologie en Pedagogiek
<b>Docent(en)</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, dr. E. van den Berg, C.L. Geraedts, drs. A. Krijgsman, dr. A.A. Kaal, dr. J.J.M. van Eersel, drs. K.L. Schaap, W. Maas, drs. G.D. van Hummel, F.L. de Vries MSc, drs. H. Stouthart, drs. I. Pauw
<b>Lesmethode(n)</b>	Hoorcollege
<b>Niveau</b>	500

### Doel vak

De student kan algemene onderwijskundige en pedagogische inzichten op het terrein van (activerende) didactiek (rol van ontwerper), communicatie in de klas (rol van uitvoerder) en gedrag- en leerproblemen (verdiepende module) vertalen naar de eigen lespraktijk.

### Inhoud vak

Deze module kent 4 onderdelen:

- de startweek (1 ects), waarin de student kennis maakt met de



opleiding, met het basisinstrumentarium van een docent en de eigen startcompetenties in kaart brengt;

- colleges ten aanzien van de rol van Ontwerper en de rol van Uitvoerder;
- colleges over gedrag- en leerproblemen, waarin problematiek en aanpak van meest gangbare gedrag- en leerproblemen aan bod komen.

### Onderwijsvorm

Colleges (hoorcolleges en werkgroepen)

### Toetsvorm

- beoordeling van het portfolio
- tentamen over de colleges gedrag- en leerproblemen

### Literatuur

Een literatuurlijst wordt verstrekt aan het begin van de opleiding

### Vereiste voorkennis

Dit vak is alleen te volgen als onderdeel van de universitaire lerarenopleiding

### Overige informatie

Voor alle onderdelen (startweek, rollen, verdiepende module) geldt een aanwezigheidsplicht

## Algemene Didactiek en Pedagogiek II

<b>Vakcode</b>	O_MLADEPII ()
<b>Periode</b>	Periode 1+2, Periode 4+5
<b>Credits</b>	3.0
<b>Voertaal</b>	Nederlands
<b>Faculteit</b>	Faculteit der Psychologie en Pedagogiek
<b>Docent(en)</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, dr. E. van den Berg, C.L. Geraedts, drs. A. Krijgsman, dr. A.A. Kaal, dr. J.J.M. van Eersel, drs. K.L. Schaap, W. Maas, drs. G.D. van Hummel, F.L. de Vries MSc, drs. H. Stouthart, drs. I. Pauw
<b>Lesmethode(n)</b>	Hoorcollege, Werkcollege
<b>Niveau</b>	500

### Doel vak

De student kan:

1. leerlingen, als individu en als lid van de groep, ondersteunen en stimuleren in hun verdere persoons- en identiteitsontwikkeling;
2. de voorbeeldfunctie ten opzichte van leerlingen vormgeven en daarop reflecteren;
3. leerlingen helpen bij de voorbereiding op hun rol in de samenleving als actief participierend burger;
4. deze en eerdere verworven competenties aantonen in een showcaseportfolio

### **Inhoud vak**

Deze module kent 2 onderdelen:

- colleges ten aanzien van de rol van Pedagoog;
- het werken aan de rol opdrachten voor de rol van uitvoerder, ontwerper en pedagoog voor het showcaseportfolio;

### **Onderwijsvorm**

Colleges (hoorcolleges en werkgroepen) en zelfstudie

### **Toetsvorm**

- een tentamen betreffende de rol van Pedagoog
- beoordeling van het showcase portfolio, waarin de student de verworven competenties ten aanzien van alle rollen aantoont

### **Literatuur**

Een literatuurlijst wordt verstrekt aan het begin van de opleiding, en staat op Blackboard bij de betreffende studieonderdeel

### **Vereiste voorkennis**

Dit vak is alleen te volgen als onderdeel van de universitaire lerarenopleiding

### **Overige informatie**

Voor de colleges geldt een aanwezigheidsplicht. Studenten die dit vooraf met de vakdidacticus/mentor overeengekomen zijn, kunnen in zelfstudie onderdelen afronden.

## **Analysis of Governmental Policy**

<b>Vakcode</b>	AM_470571 ()
<b>Periode</b>	Periode 1
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	drs. R.M. Edelenbosch MA
<b>Examinator</b>	prof. dr. J.T. de Cock Buning
<b>Docent(en)</b>	prof. dr. J.T. de Cock Buning
<b>Lesmethode(n)</b>	Hoorcollege, Werkgroep, Computerpracticum
<b>Niveau</b>	500

### **Doel vak**

- 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.

### **Inhoud vak**

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.

### **Onderwijsvorm**

Analysis of Governmental Policy is a fulltime course of four weeks (6 ECTS). The most recent course schedule is to be found on Blackboard. The total study time is 160 hours. Tuition methods include lectures, training workshops, and self-study.

The different elements have the following study time:

- lectures: 15 hours
- project: 147 hours (within the project: 18x 1 hour coach meeting)
- self study: (within the project, defined in the group)
- 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

### **Toetsvorm**

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%)). Exam has to be passed successfully.

### **Literatuur**

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

### **Aanbevolen voorkennis**

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

### **Doelgroep**

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.

### Overige informatie

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.

## Bio-analysis & Clinical Diagnostics

<b>Vakcode</b>	X_432765 ()
<b>Periode</b>	Periode 1
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	dr. H. Lingeman
<b>Examinator</b>	dr. H. Lingeman
<b>Docent(en)</b>	dr. H. Lingeman
<b>Lesmethode(n)</b>	Hoorcollege
<b>Niveau</b>	400

### Doel vak

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

### Inhoud vak

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.

### Onderwijsvorm

Lectures and tutorials.

### Toetsvorm

Written or oral examination.

### Literatuur

Hand-outs (electronically available).

### Aanbevolen voorkennis

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

### Doelgroep

mCH-AS, mDDS, mMNS

## Biomedical Modelling and Simulation

<b>Vakcode</b>	X_430112 (430112)
<b>Periode</b>	Periode 1

<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	dr. I.H.M. van Stokkum
<b>Examinator</b>	dr. I.H.M. van Stokkum
<b>Docent(en)</b>	dr. I.H.M. van Stokkum, prof. dr. G.J.M. Stienen, dr. ir. T.J.C. Faes, dr. J.C. de Munck
<b>Lesmethode(n)</b>	Hoorcollege, Werkcollege, Practicum, Werkgroep
<b>Niveau</b>	400

### **Doel vak**

To gain knowledge of the most important theoretical and practical concepts in modelling and simulation of biomedical processes at different scales, ranging from macroscopic organ function, cellular function down to biochemical interactions and signaling pathways within cells.

To gain experience with and to apply MatLab and Mathematica to acquire, analyse and evaluate biomedical signals and to model and simulate biomedical processes.

### **Inhoud vak**

This course will start with a general overview the various types of models used to describe biomedical processes by parametric and non-parametric models using linear and non linear (differential) equations. Basic knowledge of vector and matrix calculations and differential equations is required but will be refreshed.

During the course, attention will be paid to viscoelastic models, spectral analysis, compartment models, geometric modelling used in image analysis and models to describe molecular structures and their dynamic behaviour.

Examples will concentrate on cardiovascular function: linear and nonlinear

viscoelastic models of pressure volume relations, compartment models of the interaction between contractile proteins to simulate force and pressure development and a description of an ion pump for instance to import Ca-ions into the cell during an action potential.

The introductory lectures will be combined and followed by practical courses in which, through exercises, experience will be gained of MatLab and Mathematica (4th generation computer languages). Finally students will be offered a choice of 1 out of 5 modelling problems to be solved in groups of 2 or 3 students each, guided by a supervisor. At the end of the course each group will present and discuss their work with all participants and supervisors of the course.

### **Onderwijsvorm**

Lectures, working groups, assignments.

### **Toetsvorm**

Assignments (20%), report and presentation on modelling problem (40%) and written exam (40%).

## Literatuur

Syllabus.

Book (recommended): Gilat, A., MatLab: An Introduction with Applications 5th ed, Wiley.

## Doelgroep

mCh-SBI, mMNS-MPs, mMNS-PoL, mMNS-MPy, mPhys-PLH, mPhys-SBI

## Biomedical Optics

<b>Vakcode</b>	X_428529 (428529)
<b>Periode</b>	Periode 5
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Niveau</b>	400

## Inhoud vak

The course description is; available on

<http://studiegids.uva.nl/web/uva/sgs/en/c/10865.html>

## Overige informatie

Opgave via <https://www.sis.uva.nl> tot 4 weken voor aanvang van het semester is verplicht.

Course registration at the UVA is compulsory at least 4 weeks before the start of the semester via <https://www.sis.uva.nl>.

## Biophotonics I: Microspectroscopy

<b>Vakcode</b>	AM_470629 ()
<b>Periode</b>	Periode 3
<b>Credits</b>	3.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	dr. ir. Y.J.M. Bollen
<b>Examinator</b>	dr. ir. Y.J.M. Bollen
<b>Docent(en)</b>	prof. dr. ir. E.J.G. Peterman, dr. ir. Y.J.M. Bollen
<b>Lesmethode(n)</b>	Hoorcollege
<b>Niveau</b>	400

## Doel vak

To introduce students into various spectroscopic and microscopic techniques.

Students should know the theoretical principles and the applicability in life sciences of:

- absorption spectroscopy
- fluorescence spectroscopy
- light microscopy
- fluorescence microscopy

### **Inhoud vak**

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

### **Onderwijsvorm**

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

### **Toetsvorm**

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

### **Literatuur**

Notes, handouts and papers

### **Doelgroep**

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

### **Overige informatie**

Due to largely overlapping contents this course is NOT intended for students who have taken the FEW BSc course "Microscopische beeldvorming (X\_420529)".

Practical training in the techniques discussed here is offered in Biophotonics 3, for which Biophotonics 1 is required.

## **Biophotonics III: Practical Training**

<b>Vakcode</b>	AM_470630 ()
<b>Periode</b>	Periode 3
<b>Credits</b>	3.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	dr. ir. Y.J.M. Bollen
<b>Examinator</b>	dr. ir. Y.J.M. Bollen
<b>Niveau</b>	400

### **Doel vak**

To introduce students into the application of various optical techniques, mainly fluorescence spectroscopy and microscopy.

Students should be able to:

- plan and conduct experiments using optical techniques
- evaluate results on the basis of theoretical knowledge and recent literature
- present their results in short reports and one journal-style paper

### **Inhoud vak**

Optical spectroscopy and microscopy are widely used in cell biology and biophysics. In this course students will obtain hands- on experience with absorption spectroscopy, fluorescence spectroscopy (e. g. FRET and anisotropy) and fluorescence microscopy. The theory behind these

techniques is already given in Biophotonics 1, which is required to enter this course. Small groups of students will prepare the experiments, discuss them with the lecturer and carry them out. The group will write a short report on each experiment and one journal-style paper.

### Onderwijsvorm

Experiments ( $\pm 24$  hours) are performed in small groups. Experiments need to be prepared and reports need to be written.

### Toetsvorm

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

### Literatuur

Reader (5 euro)

Papers and protocols that will be made available through Blackboard

### Vereiste voorkennis

Biophotonics: Microspectroscopy (AM\_470629) or Microscopische beeldvorming (X\_420529) are required to enter this course.

### Doelgroep

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

### Overige informatie

The theoretical background of the techniques used here is discussed in Biophotonics: Microspectroscopy (AM\_470629).

## Business Management in Health and Life Sciences

<b>Vakcode</b>	AM_470584 ()
<b>Periode</b>	Periode 2
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	prof. dr. H.J.H.M. Claassen
<b>Examinator</b>	prof. dr. H.J.H.M. Claassen
<b>Docent(en)</b>	prof. dr. H.J.H.M. Claassen
<b>Lesmethode(n)</b>	Hoorcollege, Computerpracticum
<b>Niveau</b>	500

### Doel vak

To acquire insight in different legal entities in which to organise a company or enterprise

To get acquainted with:

- financial and legal aspects
- patents and alternative valorization methods
- marketing and sales aspects of businesses

To acquire insight in Human Resource Management models

To get acquainted with different models of financing

To learn to think and act in line with economic and sustainability issues for the company



## Inhoud vak

Increasingly, health students will be confronted with a corporate way of thinking in health organisations. To function in such an environment it is critical that students have basic knowledge of fiscal and legal entities and organisational forms of corporate structures (including start-ups). Furthermore, they have to understand what motivates decision makers and financial officers in different companies (also geographical differences). This course comprises a theoretical and a practical part. The theoretical part consists of interactive classes with various experts from the field. Topics that will be dealt with in detail include: 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 practical part consists of bringing the knowledge acquired during the classes into practice in an assignment in which you develop a (personal career) businessplan.

## Onderwijsvorm

Lectures:35h

Assignment: 4h

Work on assignment (self study): 40h

Preparing the exam: 81h

## Toetsvorm

Written exam: 50%

Personal Business Plan: 50%

Both have to be passed

## Literatuur

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

## Doelgroep

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

## Overige informatie

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

## Clinical development and clinical trials

<b>Vakcode</b>	AM_470585 ()
<b>Periode</b>	Periode 3

<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	prof. dr. H.J.H.M. Claassen
<b>Examinator</b>	prof. dr. H.J.H.M. Claassen
<b>Docent(en)</b>	prof. dr. H.J.H.M. Claassen
<b>Lesmethode(n)</b>	Hoorcollege, Computerpracticum, Werkgroep
<b>Niveau</b>	500

### Doel vak

To acquire knowledge and insight into the role and objectives of drug and clinical development process

To acquire knowledge and insight into the clinical pharmacology in drug development, drug interactions, pharmacodynamic and metabolic interactions

To acquire knowledge and insight into clinical study methodology

To acquire knowledge and skills into the regulatory principles

To acquire knowledge of ICH-GCP and quality

To acquire knowledge and insight into clinical trial coordination

To acquire knowledge and skills into the data management and statistics.

To acquire insight into the ethical aspects

To acquire insight into actual use of clinical trials in R&D

strategies

To learn to design a clinical study

To acquire insight into the different epidemiologic study designs

To acquire knowledge and skills into how exposure and disease in a population can be measured and how the relationships between them can be assessed (using SPSS)

To acquire knowledge and skills into interpreting and presenting the results of an epidemiologic study

### Inhoud vak

The need for rigorous evaluation of components of health care is increasingly recognised worldwide. An important type of evaluation is the clinical trial. The most commonly performed clinical trials evaluate new drugs, medical devices, biologics, or other interventions on patients in strictly scientifically controlled settings, and are required for regulatory authority approval of new therapies. 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 of health interventions. Furthermore classes are provided on which the actual use of clinical trials in day to day R&D strategies within industry and universities is addressed in detail. Classes include: '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'.

An additional week of basic epidemiology will help you to complement the knowledge obtained so far in the course with an understanding of the principles of other types of study designs (cross-sectional, longitudinal, case-control). 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.

### Onderwijsvorm

Lectures:25h

(Computer) workgroup: 32h

Preparing the exam: 2h

### Toetsvorm

Written exam: 100%

### Literatuur

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

### Doelgroep

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

### Overige informatie

Guest lecturers/organisations:

- Eric Klaver
- DOCS
- Others to be announced

## Colloquium / Literature thesis Medical Natural Sciences - Analytische Chemie en Toegepaste Spectroscopie

<b>Vakcode</b>	X_432606 (432606)
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	12.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	dr. H. Lingeman
<b>Examinator</b>	dr. H. Lingeman
<b>Niveau</b>	600

### Doel vak

Literature study on a topic related to Molecular Clinical Diagnostics

### Inhoud vak

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

### Onderwijsvorm

Self study and discussion sessions

### Toetsvorm

Report and presentation

### Doelgroep

mMNS

## Colloquium / Literature thesis Medical Natural Sciences - Biofysica

<b>Vakcode</b>	X_432608 (432608)
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	12.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Niveau</b>	600

### Colloquium / Literature thesis Medical Natural Sciences - Fysica van complexe systemen

<b>Vakcode</b>	X_432610 (432610)
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	12.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Niveau</b>	600

### Colloquium / Literature thesis Medical Natural Sciences - Vumc-klinische chemie

<b>Vakcode</b>	X_432604 (432604)
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	12.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	dr. ir. T.J.C. Faes
<b>Examinator</b>	dr. ir. T.J.C. Faes
<b>Niveau</b>	600

### Colloquium / Literature thesis MNS - Medical Physics

<b>Vakcode</b>	X_432611 (432611)
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	dr. ir. T.J.C. Faes
<b>Examinator</b>	dr. ir. T.J.C. Faes
<b>Niveau</b>	600

### Colloquium / Literature thesis MNS - Medical Physics

<b>Vakcode</b>	X_432612 (432612)
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	12.0

<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	dr. ir. T.J.C. Faes
<b>Examinator</b>	dr. ir. T.J.C. Faes
<b>Niveau</b>	600

### Colloquium / Literature thesis MNS - Medical Physiology

<b>Vakcode</b>	X_432613 (432613)
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	prof. dr. G.J.M. Stienen
<b>Examinator</b>	prof. dr. G.J.M. Stienen
<b>Niveau</b>	600

### Colloquium / Literature thesis MNS - Medical Physiology

<b>Vakcode</b>	X_432614 (432614)
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	12.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	prof. dr. G.J.M. Stienen
<b>Examinator</b>	prof. dr. G.J.M. Stienen
<b>Niveau</b>	600

### Colloquium / Literature thesis MNS - Molecular Clinical Diagnostics

<b>Vakcode</b>	X_432769 ()
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	6.0
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	dr. H. Lingeman
<b>Examinator</b>	dr. H. Lingeman
<b>Niveau</b>	600

#### Doel vak

Literature study on a topic related to the molecular clinical diagnostics.

#### Inhoud vak

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

**Onderwijsvorm**

Selfstudy and discussion sessions.

**Toetsvorm**

Report and presentation.

**Doelgroep**

mMNS

## Colloquium / Literature thesis MNS - Molecular Clinical Diagnostics

<b>Vakcode</b>	X_432771 ()
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	12.0
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	dr. H. Lingeman
<b>Examinator</b>	dr. H. Lingeman
<b>Niveau</b>	600

**Doel vak**

Literature study on a topic related to the molecular clinical diagnostics.

**Inhoud vak**

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

**Onderwijsvorm**

Selfstudy and discussion sessions.

**Toetsvorm**

Report and presentation.

**Doelgroep**

mMNS

## Colloquium / Literature thesis MNS - Physics of Life

<b>Vakcode</b>	X_432768 ()
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	dr. S.M. Witte
<b>Examinator</b>	dr. S.M. Witte
<b>Niveau</b>	600

## Colloquium / Literature thesis MNS - Physics of Life

<b>Vakcode</b>	X_432770 ()
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<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	12.0
<b>Voertaal</b>	Nederlands
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	dr. S.M. Witte
<b>Examinator</b>	dr. S.M. Witte
<b>Niveau</b>	600

## Communication, Organization and Management

<b>Vakcode</b>	AM_470572 ()
<b>Periode</b>	Periode 2
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	dr. T.P. Groen
<b>Examinator</b>	dr. T.P. Groen
<b>Docent(en)</b>	dr. H. Wels, prof. dr. F. Scheele, dr. M.B.M. Zweekhorst
<b>Lesmethode(n)</b>	Hoorcollege, Werkgroep
<b>Niveau</b>	500

### Doel vak

- 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

### Inhoud vak

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.

### Onderwijsvorm

Lectures (approximately 22 hours), response lectures (4 hours), self study, training workshops (12 hours), self-study and writing project assignment (approximately 120 hours).

### Toetsvorm

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.

### Literatuur

To be announced on Blackboard

### Doelgroep

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

### Overige informatie

Attendance to training, workshops, interviews and discussions is indispensable

## Differentiëren en integreren 3

<b>Vakcode</b>	X_400577 (400577)
<b>Periode</b>	Periode 4
<b>Credits</b>	3.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	dr. B.T. Knapik
<b>Examinator</b>	dr. B.T. Knapik
<b>Docent(en)</b>	dr. B.T. Knapik
<b>Lesmethode(n)</b>	Hoorcollege, Werkcollege
<b>Niveau</b>	200

### Doel vak

After this course students:

- can apply calculus techniques to mathematical problems (in multiple dimensions),
- can analyse a practical problem and translate it into a calculus problem,
- can study mathematical texts in English.

### Inhoud vak

Double and multiple integrals, vector fields, line and surface integrals of functions and vector fields, Green's theorem, Gauss's theorem (the divergence theorem), and Stokes's theorem.

### Onderwijsvorm

Lectures and exercise class.



**Toetsvorm**

Written exam and assignments (optional).

**Literatuur**

Adams, R.A. en Essex, C., Calculus: a Complete Course, 8th Edition. Pearson 2013.

**Doelgroep**

3MNW

**Overige informatie**

This course is taught in English.

## Disability and Development

<b>Vakcode</b>	AM_470588 ()
<b>Periode</b>	Periode 2
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	H.B. Miranda Galarza MSc
<b>Examinator</b>	H.B. Miranda Galarza MSc
<b>Lesmethode(n)</b>	Hoorcollege, Werkgroep
<b>Niveau</b>	500

**Doel vak**

- To develop an understanding of disability and the issues faced by people with disabilities
- To develop knowledge and skills for disability research, policy development and management related to disability, rehabilitation and development
- To acquire insight into the epidemiology of disability, with separate attention for important determinants like gender, poverty and HIV/AIDS
- To learn how to use relevant models of disability and the conceptual framework of the International Classification of Functioning, Disability and Health (ICF)
- To understand the importance of human rights in relation to disability and to learn to use the UN Convention for the Rights of Persons with Disabilities for advocacy and other rights-based interventions
- To acquire skills and knowledge in measurement and research methods relevant to disability
- To understand the importance of inter-sectoral collaboration
- To gain insight in participatory approaches

**Inhoud vak**

The Disability and Development (D&D) course focuses on a broad range of issues related to disability and rehabilitation in the context of development. This means that the focus is on people with disabilities in low and middle-income countries. Disability affects an estimated 1 billion people worldwide, the majority of whom live in low and middle-income countries. The large majority are poor and have no access to rehabilitation services; neither are facilities in place to allow them

to be included in the mainstream of society.

To date, very few services and programmes are available to address these needs. The realisation that the Millennium Development Goals cannot be met without addressing the needs of people with disability has brought a new impetus to the field of disability and development. Another major recent development was the adoption of the UN Convention on the Rights of Persons with Disabilities in December 2006. It is expected that there will be a substantial increase in demand for training of a large variety of professionals (e.g. researchers, managers, architects, lawyers, health professionals) with formal training and qualifications in the field of disability-inclusive development.

This rapidly increasing interest in disability, as a development and human rights issue, means that this emerging field of study will rapidly gain in importance and should become part of any serious higher education programme in social and development studies and in international public health. The course will cover essential knowledge and skills in this subject.

The 4-week course programme will include the following subjects:

- Disability models and stereotypes,
- Frequencies and distribution of disability,
- Experience of having a disability,
- ICF conceptual framework,
- Disability rights, including the UN Convention on the Rights of Persons with Disabilities,
- Culture and disability,
- Determinants of disability, including stigma and discrimination, poverty, gender and HIV/AIDS,
- Disability-relevant research methods, including examples of disability research
- An introduction to community-based rehabilitation and disability inclusive development.

### **Onderwijsvorm**

Problem-based learning supported by lectures and an article writing assignment

The programme comprises 168 study hours, divided as follows:

- Lectures: 36
- Tutorial groups: 18
- Other events: 12
- Self-study: 102

### **Toetsvorm**

Participation in tutorial groups: 10%

Take-home examination, submitted electronically: 60%

Scientific article: 30%

### **Literatuur**

See e-reader

### **Vereiste voorkennis**

Bachelor-level education; any subject

### **Doelgroep**

The Disability & Development module is an optional course for Master students Management, Policy Analysis and Entrepreneurship in Health and Life Sciences (MPA), International Public Health and Biomedical

Sciences; external students from low and middle-income countries are strongly encouraged to apply. We encourage the participation of students with disabilities, especially from low and middle-income countries.

### Overige informatie

For more information contact dr. Christine Dedding ([c.dedding@vu.nl](mailto:c.dedding@vu.nl)) or dr. Beatriz Miranda Galarza ([b.mirandagalarza@vu.nl](mailto:b.mirandagalarza@vu.nl))

## Drug-induced Stress and Cellular Responses

<b>Vakcode</b>	X_432536 (432536)
<b>Periode</b>	Periode 2
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	dr. J.N.M. Commandeur
<b>Examinator</b>	dr. J.N.M. Commandeur
<b>Docent(en)</b>	dr. J.N.M. Commandeur
<b>Lesmethode(n)</b>	Hoorcollege
<b>Niveau</b>	500

### Doel vak

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.

### Inhoud vak

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.

### Onderwijsvorm

Lectures and self study.

### Toetsvorm

Written exam

## Literatuur

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

## Vereiste voorkennis

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

## Doelgroep

mDDS, mBMS

## Dynamics of Biomolecules and Cells

<b>Vakcode</b>	X_422583 ()
<b>Periode</b>	Periode 4
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	dr. J.T.M. Kennis
<b>Examinator</b>	dr. J.T.M. Kennis
<b>Docent(en)</b>	dr. J.T.M. Kennis
<b>Lesmethode(n)</b>	Hoorcollege
<b>Niveau</b>	400

## Doel vak

Life is, by its very definition, a dynamic quantity. In this course an overview is given of dynamic processes that take place in biomolecules, membranes and cells in relation to biological functionality, and the biophysical methods that are applied to study them.

## Inhoud vak

The significance of small movements to large-scale and slow reorganizations are being discussed as well the experimental techniques employed.

- DNA processing and dynamics (techniques: optical tweezers, AFM, tethered particle motion, magnetic tweezers). DNA structure and stability, DNA/RNA polymerase, DNA architectural proteins, DNA repair.
- Protein dynamics (techniques: ultrafast spectroscopy, Infrared and Raman spectroscopy, single-molecule fluorescence). Photoactive proteins, light-driven enzymes, Motor proteins, optogenetics.
- Membrane dynamics and remodeling (techniques AFM, single molecule, electron microscopy). Photosynthesis, crowding and membrane protein diffusion, Neuroimaging.
- superresolution microscopy

## Onderwijsvorm

Lectures, guest lectures, literature essay, oral literature presentation

## Toetsvorm

- Essay (literature or research proposal)
- Oral literature presentation
- written Exam

## Literatuur

Notes, handouts and papers.

## Vereiste voorkennis

BSc. Physics, BSc. Medical Natural Sciences, BSc Chemistry or comparable

## Doelgroep

mMNS-PoL, mPhys-LSBP, mPhys-PLH

## Elektronica en signaalverwerking

<b>Vakcode</b>	X_420533 (420533)
<b>Periode</b>	Periode 4
<b>Credits</b>	6.0
<b>Voertaal</b>	Nederlands
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	drs. ing. J.M. Mulder
<b>Examinator</b>	drs. ing. J.M. Mulder
<b>Docent(en)</b>	drs. ing. J.M. Mulder
<b>Lesmethode(n)</b>	Practicum
<b>Niveau</b>	300

## Doel vak

Het doel van het "Elektronica en Signaalverwerking" practicum is het bekend worden met verschillende relevante meet-, regel- en signaalverwerkingstechnieken, die in de experimentele onderzoeksgroepen gebruikt worden. Technieken zoals lock-in versterker, PID regelsystemen en verschillende filters, waarbij zowel naar hardwarematige als softwarematige oplossingen gekeken wordt. Voor het begrijpen, ontwerpen en onderzoeken van deze technieken is kennis nodig in de basisbegrippen van de elektronica, die in het begin van de cursus behandeld worden. In de cursus worden ook vaardigheden geleerd in probleemoplossende en -voorkomende methoden in complexe elektronische schakelingen (meetsystemen).

## Inhoud vak

In het college zullen de volgende onderwerpen aan de orde komen:

De basisprincipes en analysetechnieken in gelijk- en wisselstroom circuits;

netwerken en vervangingsschema's

complexe overdrachtsfuncties en bodeplots

van verschillende filters en resonantiecircuits.

Diodeschakelingen;

enkel- en dubbelfasige gelijkrichting.

Operationele versterkerschakelingen en circuits met negatieve

terugkoppeling;

Niet inverterende versterkers

Bufferversterkers

Som- en verschilversterkers

Instrumentatieversterker

Integrator

Differentiator

Actieve filters; het Butterworth filter.

Digitale logica;

Adder (half en full)  
 Multiplexer en demultiplexer  
 Regelsystemen;  
 Een analoge P-regelaar.  
 Een digitale PID-regelaar.  
 Modulatie en demodulatie technieken;  
 Amplitude (de)modulatie  
 Synchrone detector; Onderzoeken van een Lock-in detector

### Onderwijsvorm

Geïntegreerd college en practicum.

### Toetsvorm

De beoordeling vindt plaats op grond van de resultaten van schriftelijke toetsen, het vertoonde inzicht en de experimentele vaardigheid tijdens de uitvoering van de experimenten, en het bijgehouden waarnemingenboek.

### Literatuur

Practicumhandleiding en aanvullende informatie.

### Doelgroep

3N, 3WN en mMNS-MPs (verplicht voor aantekening NVKF)

## Entrepreneurship in Health and Life Sciences

<b>Vakcode</b>	AM_470575 ()
<b>Periode</b>	Periode 2
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	prof. dr. E. Masurel
<b>Examinator</b>	prof. dr. E. Masurel
<b>Docent(en)</b>	prof. dr. E. Masurel
<b>Lesmethode(n)</b>	Hoorcollege, Werkgroep
<b>Niveau</b>	500

### Doel vak

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.

### **Inhoud vak**

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?

### **Onderwijsvorm**

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
- self study 65 hours
- examination 4 hours

### **Toetsvorm**

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.

### **Literatuur**

To be announced on Blackboard

### **Doelgroep**

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.

### **Overige informatie**

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

[anna.van.luijn@falw.vu.nl](mailto:anna.van.luijn@falw.vu.nl)

## Ethics in Medical Research

<b>Vakcode</b>	X_422592 ()
<b>Periode</b>	Periode 3
<b>Credits</b>	3.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	prof. dr. J.T. de Cock Buning
<b>Examinator</b>	prof. dr. J.T. de Cock Buning
<b>Docent(en)</b>	prof. dr. J.T. de Cock Buning
<b>Lesmethode(n)</b>	Hoorcollege, Werkcollege, Werkgroep
<b>Niveau</b>	400

### Doel vak

The student acquires knowledge and insight into:

- The central concepts and theory in applied philosophy and professional ethics
- The challenges of being an ethical responsible researcher
- The instrumental role of professional codes of conduct
- The role of ethical review committees in medical research
- Ethical aspects in relation to translational research

The student will investigate and reflect on:

- relevant key concepts in ethics (e.g. medical ethics, ethics of care, deontology and consequentialistic approaches)
- their own capacity to exercise an open and respectful attitude with respect to diverse value patterns
- moral dilemmas including implicit and explicit moral choices in responsible research Innovation

At the end of the course the student will be able to:

- To apply methods and techniques for facilitating constructive discussions about ethical aspects in (international) health research and issues
- To formulate a proper justification in technological research projects
- To tackle ethical dilemmas in a responsible and professional manner
- To structure and write an ethical paragraph of an research proposal
- To identify the creeping mechanisms of bad science on our society

### Inhoud vak

Researchers in the field of medical health research offer the medical field option for cure, prevention and enhancement, which can mean profound chances in their lives like extension of life, prediction of hidden illness and compensation of disabilities. It is important that researchers take responsibility for the decisions that they make when designing and implementing applied products. In this course, the students learn about different methods to analyze and options to deal with dilemmas appropriate for ethically justifiable research. Relevant case studies in the field of medical technical health research will be



used as illustration.

In small work groups, students are encouraged to analyze and deal impartially with ethical dilemmas.

### Onderwijsvorm

The total study time is 80 hours.

The different elements have the following study time:

- Lectures: 2 hours
- Work groups: 12 hours
- Project third week: 16 hours
- Exam: 2 hour
- Presentation : 2 hours
- Self working first, second and last week: 46 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 work groups, and to pass the exam.

### Toetsvorm

The exam is a mix of MC questions regarding definitions and use of the relevant key concepts, and exercises to analyze a complex professional ethical problem with the tools you learned in the work groups (Werk Colleges) and project.

### Literatuur

Will be made available on Blackboard

### Vereiste voorkennis

Research experience

### Doelgroep

Students of master Medical Natural Sciences

## Health, Globalisation and Human Rights

<b>Vakcode</b>	AM_470818 ()
<b>Periode</b>	Periode 2
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	dr. C.W.M. Dedding
<b>Examinator</b>	dr. C.W.M. Dedding
<b>Docent(en)</b>	prof. dr. P. Heutink, dr. M.G.B.C. Bertens
<b>Lesmethode(n)</b>	Hoorcollege, Werkgroep
<b>Niveau</b>	500

### Doel vak

The student;

- Is able to describe, understand and apply human rights concepts in a global context
- Develops a deeper understanding and A critical attitude towards scientific literature in the field of health, globalization and human rights in order to formulate soundly argued positions
- Is able to create his/her own vision with regard to the socio-cultural

dimensions of human rights values in relation to public health  
- Is able to apply methods of human rights assessment in relation to innovations in health care  
- Demonstrates the ability to write and present according to academic standards

### **Inhoud vak**

This course focuses on the human rights issues that are raised around the globe in connection with public health concerns. The course introduces the students to the effects of globalization on health issues, to the relevant UN human rights instruments on health and to the mechanisms to promote and protect these rights. Attention is given to a wide range of human rights topics in which health and well being play a crucial role. Examples are situations of armed conflict, reproductive rights, migration and refugee issues and childrens rights. Within the context of current globalisation processes the importance of local cultural insights into the human rights & public health interaction will be discussed. During the course students will prepare and participate in a simulation on a human rights assessment of innovations in health technology and discuss relevant scientific literature in study groups. In the exam students will show their creative problem-solving skills applying them to human rights dilemmas in public health.

### **Onderwijsvorm**

Contact hours

Lectures: 33 hours

Work groups: 10 hours

Group project, simulation and exam: 8 hours

Self study and preparing: remaining hours

### **Toetsvorm**

Group project (10%), Simulation (20%), exam (70%). All parts need to be passed (6.0)

### **Literatuur**

To be announced at the start of the first work group/lecture

### **Doelgroep**

Optional course for students in all differentiations of the Masters Health Sciences, Biomedical Sciences and Management, Policy Analysis and Entrepreneurship in Health and Life Sciences.

### **Overige informatie**

(Guest) Lectures and guest organisations (under reservation):

Cees Hamelink

Christine Dedding (Children and rights)

Fiona Budge (Culture and Health)

Bert Keizer (Elderly Rights)

Els Mons (Rights and disabled persons)

Women on Waves

Doctors without Borders

And more to be announced.

For more information contact Wanda Konijn ([w.s.konijn@vu.nl](mailto:w.s.konijn@vu.nl)) or Anna van Luijn ([a.van.luijn@vu.nl](mailto:a.van.luijn@vu.nl))

# Inleiding systeembio

<b>Vakcode</b>	X_401042 (401042)
<b>Periode</b>	Periode 4
<b>Credits</b>	3.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	prof. dr. B. Teusink
<b>Examinator</b>	prof. dr. B. Teusink
<b>Docent(en)</b>	prof. dr. B. Teusink, prof. dr. F.J. Bruggeman
<b>Lesmethode(n)</b>	Hoorcollege, Practicum
<b>Niveau</b>	300

## Doel vak

The properties of cells and higher levels of organisation emerges out of molecular interactions within huge networks. Examples of such molecular-reaction networks are: metabolism, signal transduction, and gene networks. Systems biology studies the principles of such networks using experiments and theory.

The aim of this course is to introduce the students to the approach taken in systems biology. We will study a number of theoretical findings of systems biology about the dynamics and regulation of molecular networks inside living cells using mathematical models and basic principles of biochemistry and physics.

## Inhoud vak

The following topics will be discussed:

- mass-action kinetics and basic enzyme kinetics
- thermodynamic equilibrium and steady state
- dynamics of simple systems
- protein complex formation, allosteric interactions, and cooperativity
- signal-binding induced conformation changes of transcription factors and signalling receptors
- gene control by two transcription factors with allosteric interactions and cooperativity
- ultrasensitivity of small signalling circuits
- how feedforward loops can give rise to fold change detection
- role of positive and negative feedback

The practicals involve answering exercises and basic plotting of results of mathematical models.

## Onderwijsvorm

Hoorcollege, werkcollege, praktische opdrachten

## Toetsvorm

Tentamen

## Literatuur

Syllabus (gratis)

## Vereiste voorkennis

Basale kennis van differential vergelijkingen, (bio-)chemische reacties, en cel biologie.

**Doelgroep**  
3MNV

## Internship Communication Specialisation

<b>Vakcode</b>	AM_471148 ()
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	30.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	dr. J.F.H. Kupper
<b>Examinator</b>	dr. J.F.H. Kupper
<b>Niveau</b>	600

### Doel vak

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.

### Inhoud vak

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). MPA students that choose the Science Communication specialization also need to do at least one internship (30 ECTS, 5 months) in the Science Communication field. The internship has two possible formats: the full Research Internship and the Reflective Practice Placement (RPP). The complete and up-to-date information about the internship can be found in the SC internship guide line on blackboard (science communication community).

### Onderwijsvorm

Work placement, under supervision of VU-staff.

### Toetsvorm

Within six weeks after the start of the internship a Go/No Go evaluation is made by the VU supervisor. The aim of this interim evaluation is to decide whether the project and the student both have enough potential to continue (Go) or not (No Go). This evaluation is based on:

- Written material by the student, including a final research proposal and either the Introduction or Methods section of the article or both.

- Attitude of the student and execution of the project during the initial stage.

The final assessment of the internship is undertaken by the VU-supervisor and the second assessor.

In the final assessment, the VU supervisor assesses four different aspects of the internship:

- the attitude of the student
- the execution of the reflective practice placement
- the final report/article
- the oral presentation

The second assessor provides an assessment of the final report only.

The final report counts for 50% of the final grade, the oral presentation for 25% and the execution of the research also for 25%. Only if marks for each item given by the VU-supervisor and the second assessor are 6 or higher and the attitude is a 'pass', the internship is regarded as sufficient. The final grade is calculated from the marks given by both assessors and, together with other administrative details, is summarized in the final assessment form, done by the master's coordinator.

### **Vereiste voorkennis**

The student is enrolled in the Master's programme Biology of which the internship is part.

The student has passed the following courses:

AM\_470582, Qualitative and Quantitative Research Methods

AM\_470587, Science and Communication

And the student has acquired 6EC of the following courses:

AM\_470572, 6EC, Communication, Organization and Management

AM\_1002, 6EC, Science in Dialogue

AM\_471014, 6EC, Science Journalism

AM\_470590, 6EC, Science Museology

The second internship can only start after the first internship has been fully completed.

### **Doelgroep**

Students from the MSc Biology to specialize in Communication

### **Intekenprocedure**

The research proposal is approved by the placement coordinator and the VU-supervisor, after which the application has to be approved by the masters' coordinator in advance (on behalf of the examination board).

The Placement Manual describes the process of completing the internship from the beginning (the admission) through the actual execution with its supervision to the final stage (assessment and grading) in consecutive order. The various stages of the process will be supported by forms which are supplied in the appendices or in links. Please see the placement manual on Blackboard (ALW\_BMW\_9999\_01: Master Programmes Biomedical Sciences and Biology).

### **Overige informatie**

The Placement Manual is based upon the 'Student Placement (Internship) and Research Project Regulations' of the Faculty of Earth and Life Sciences (FALW). Detailed information can be found in the Placement manual Biology on Blackboard (ALW\_BMW\_9999\_01: Master Programmes Biomedical Sciences and Biology) and in the Academic and Examination Regulations (AER).

## Internship Science in Society (BIO)

<b>Vakcode</b>	AM_1134 ()
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	30.0
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	dr. T.J. Schuitmaker-Warnaar
<b>Examinator</b>	dr. T.J. Schuitmaker-Warnaar

### Doel vak

The aim of the internship as part of the Major Science in Society (societal specialisation) is to apply the competences acquired during the previous courses in a research project in order to ground the knowledge, attitudes and skills of interdisciplinary research. More specifically, the aims of the internships are:

- The student learns to independently conduct scientific research.
- The student is able to independently find scientific information and to evaluate this for the benefit of his or her own research question.
- The student is able to apply scientific methods and knowledge, to answer research questions and to generate evidencebased knowledge.
- The student is able to formulate a research question, to choose, to implement and to evaluate the (appropriate) research method, and to phrase the obtained results in report.
- The student is able to cooperate with researchers of various disciplines.
- The student is able to orally present the research results and to discuss the findings.
- The student obtains a good impression of a potential future field of career.

### Inhoud vak

The internship is a compulsory part of the one year specialisation as part of the regular master. The duration of the internship is 5 months (30 EC). An internship placement must provide the student with the opportunity to learn how to conduct research under supervision. The onsite supervisor of the internship is linked to an academic or research institution.

Internships can be done at various locations such as the Ministry of Health, Welfare and Sports, the Public Health Inspectorate, the Health Council, medical organizations such as the municipality health service (GGD), consultancies, the (pharmaceutical) industry and several research institutes, such as universities or e.g. the National Institute for Public Health and the Environment (RIVM).

An internship typically has three phases

- In the first phase, you write your research proposal consisting of an introduction, background, theoretical/conceptual framework, research questions and your research methodology.
- In the second phase, you collect your (qualitative and/or quantitative) data.
- In the third phase, you do your final analysis and present your findings both orally and in a report. The presentation seminar is a

compulsory part of this third phase.

### **Onderwijsvorm**

Research internship

### **Toetsvorm**

Report (55% ), Oral presentation (15%), Execution (30%) and Attitude (Pass/fail)

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 onsite supervision can be carried out by a trainee research assistant (AIO), postdoc or researcher.

### **Vereiste voorkennis**

To ensure that students do have enough background knowledge, it is required that you have passed the three compulsory courses: 'Qualitative and Qualitative Research Methods', 'Communication Organization and Management', and 'Analysis of Governmental Policy' (grade at least 6).

### **Doelgroep**

Students Major Science in Society (societal specialisation)

### **Intekenprocedure**

Internships can only start when the draft research proposal and application and agreement form is approved and signed by the specialization coordinator.

### **Overige informatie**

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 Examination Board.

Information on internships is made available on Blackboard.

## **Introductie Medische Beeldbewerking**

<b>Vakcode</b>	X_432630 (432630)
<b>Periode</b>	Periode 2
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	dr. ir. T.J.C. Faes
<b>Examinator</b>	dr. ir. T.J.C. Faes
<b>Docent(en)</b>	dr. J.C. de Munck
<b>Lesmethode(n)</b>	Hoorcollege, Practicum
<b>Niveau</b>	300

**Doel vak**

The main goal of the course is to teach students how to apply basic image processing tools on medical images using MATLAB®. The student will be able to write efficient MATLAB® applications to addresses and solve a range of clinical research questions.

**Inhoud vak**

Image analysis methods play an increasingly important role in medical science and clinical patient care. This course discusses the most important image analysis techniques and explains how they can be applied. These include image histogram analysis, neighbourhood processing, image fusion, and morphological operations. Rationales for using these techniques are illustrated with examples from several imaging modalities and clinical fields. The student then learns how to apply these techniques practically using MATLAB®. The final mark is the average of the mark obtained at the written examination and the mark obtained at the final practical assignment.

**Onderwijsvorm**

lectures and practicals.

**Toetsvorm**

50% written examination,  
50% assignment practical work.  
Both should be sufficient to pass the exam.

**Literatuur**

McAndrew, A. Introduction to Digital Image Processing with MATLAB®. (ISBN 0-534-40011-6). This book will be made available through the lecturers at a price of around 60 euros.

**Vereiste voorkennis**

Two years of studies in Medical Natural Sciences, Physics, Mathematics, or Movement Sciences.

## Lasers and Quantum Optics

<b>Vakcode</b>	X_422539 (422539)
<b>Periode</b>	Periode 1
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	dr. W. Vassen
<b>Examinator</b>	dr. W. Vassen
<b>Docent(en)</b>	dr. W. Vassen
<b>Lesmethode(n)</b>	Hoorcollege, Werkcollege
<b>Niveau</b>	400

**Doel vak**

To provide insight into the theory of light, light-matter interactions and lasers.

**Inhoud vak**

- Classical Optics (Maxwell's equations, diffraction and interference)
- Nonlinear Optics



- First- and second order coherence
- Radiative transitions in atoms, Einstein coefficients, transition rates, width of spectral lines
- Lasers
- Photon statistics, shot noise
- Photon antibunching
- Coherent states
- Photon number states
- Atom-photon interactions; density matrix, Rabi oscillations, Bloch sphere
- Laser cooling and trapping

### Onderwijsvorm

Lectures, exercises.

### Toetsvorm

Written exam.

### Literatuur

Mark Fox, Quantum Optics (Oxford university Press 2006).

### Doelgroep

mMNS-PoL, mPhys-AMEP, mPhys-PLH, mCh-MSP

## Major Research Project MNS Medical Physics

<b>Vakcode</b>	X_432593 (432593)
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	39.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	dr. ir. T.J.C. Faes
<b>Examinator</b>	dr. ir. T.J.C. Faes
<b>Niveau</b>	600

## Major Research Project MNS Medical Physics

<b>Vakcode</b>	X_432772 ()
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	45.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	dr. ir. T.J.C. Faes
<b>Examinator</b>	dr. ir. T.J.C. Faes
<b>Niveau</b>	600

## Major Research Project MNS Medical Physics

<b>Vakcode</b>	X_432773 ()
<b>Periode</b>	Ac. Jaar (september)

<b>Credits</b>	51.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	dr. ir. T.J.C. Faes
<b>Examinator</b>	dr. ir. T.J.C. Faes
<b>Niveau</b>	600

### Major Research Project MNS Medical Physiology

<b>Vakcode</b>	X_432714 (432714)
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	39.0
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	prof. dr. G.J.M. Stienen
<b>Examinator</b>	prof. dr. G.J.M. Stienen
<b>Niveau</b>	600

### Major Research Project MNS Medical Physiology

<b>Vakcode</b>	X_432778 ()
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	45.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	prof. dr. G.J.M. Stienen
<b>Examinator</b>	prof. dr. G.J.M. Stienen
<b>Niveau</b>	600

### Major Research Project MNS Medical Physiology

<b>Vakcode</b>	X_432779 ()
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	51.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	prof. dr. G.J.M. Stienen
<b>Examinator</b>	prof. dr. G.J.M. Stienen
<b>Niveau</b>	600

### Major Research Project MNS Physics of Life

<b>Vakcode</b>	X_432716 ()
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	39.0

<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	dr. S.M. Witte
<b>Examinator</b>	dr. S.M. Witte
<b>Niveau</b>	600

#### Overige informatie

Period: variable

### Major Research Project MNS Physics of Life

<b>Vakcode</b>	X_432774 ()
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	45.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	dr. S.M. Witte
<b>Examinator</b>	dr. S.M. Witte
<b>Niveau</b>	600

### Major Research Project MNS Physics of Life

<b>Vakcode</b>	X_432775 ()
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	51.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	dr. S.M. Witte
<b>Examinator</b>	dr. S.M. Witte
<b>Niveau</b>	600

### Master Project Medical Physics (M,C,E-var.)

<b>Vakcode</b>	X_432627 (432627)
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	30.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	dr. ir. T.J.C. Faes
<b>Examinator</b>	dr. ir. T.J.C. Faes
<b>Niveau</b>	600

### Master Project Medical Physiology (M,C,E-var.)

<b>Vakcode</b>	X_432626 (432626)
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<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	30.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	prof. dr. G.J.M. Stienen
<b>Examinator</b>	prof. dr. G.J.M. Stienen
<b>Niveau</b>	600

## Master Project Molecular Clinical Diagnostics (for M,C,E-variant)

<b>Vakcode</b>	X_432628 (432628)
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	30.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	dr. H. Lingeman
<b>Examinator</b>	dr. H. Lingeman
<b>Niveau</b>	600

### Doel vak

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

### Inhoud vak

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.

### Doelgroep

mMNS

### Overige informatie

For further information please contact Henk Lingeman.

## Master Project Physics of Life (M,C,E-var.)

<b>Vakcode</b>	X_432629 (432629)
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	30.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	dr. S.M. Witte
<b>Examinator</b>	dr. S.M. Witte
<b>Niveau</b>	600

## Medical Imaging

<b>Vakcode</b>	X_428526 (428526)
<b>Periode</b>	Periode 4
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Niveau</b>	400

#### Inhoud vak

The course description is; available on  
<http://studiegids.uva.nl/web/uva/sgs/en/c/143.html>

#### Doelgroep

mMNS-MPs, mPhys-LSBP, mPhys-PLH

#### Overige informatie

Opgave via <https://www.sis.uva.nl> tot 4 weken voor aanvang van het semester is verplicht.

Course registration at the UVA is compulsory at least 4 weeks before the start of the semester via <https://www.sis.uva.nl>.

### Minor Research Project MNS Medical Physics

<b>Vakcode</b>	X_432634 (432634)
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	27.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	dr. ir. T.J.C. Faes
<b>Examinator</b>	dr. ir. T.J.C. Faes
<b>Niveau</b>	500

### Minor Research Project MNS Medical Physics

<b>Vakcode</b>	X_432708 (432708)
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	21.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	dr. ir. T.J.C. Faes
<b>Examinator</b>	dr. ir. T.J.C. Faes
<b>Niveau</b>	500

### Minor Research Project MNS Medical Physics

<b>Vakcode</b>	X_432780 ()
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	33.0

<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	dr. ir. T.J.C. Faes
<b>Examinator</b>	dr. ir. T.J.C. Faes
<b>Niveau</b>	500

### Minor Research Project MNS Medical Physiology

<b>Vakcode</b>	X_432782 ()
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	33.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	prof. dr. G.J.M. Stienen
<b>Examinator</b>	prof. dr. G.J.M. Stienen
<b>Niveau</b>	500

### Minor Research Project MNS Medical Physiology

<b>Vakcode</b>	X_432712 (432712)
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	21.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	prof. dr. G.J.M. Stienen
<b>Examinator</b>	prof. dr. G.J.M. Stienen
<b>Niveau</b>	500

### Minor Research Project MNS Medical Physiology

<b>Vakcode</b>	X_432713 (432713)
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	27.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	prof. dr. G.J.M. Stienen
<b>Examinator</b>	prof. dr. G.J.M. Stienen
<b>Niveau</b>	500

### Minor Research Project MNS Molecular Clinical Diagnostics

<b>Vakcode</b>	X_432710 (432710)
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	21.0

<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	dr. H. Lingeman
<b>Examinator</b>	dr. H. Lingeman
<b>Niveau</b>	500

#### Doel vak

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.

#### Inhoud vak

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.

#### Doelgroep

mMNS

#### Overige informatie

For further information please contact Henk Lingeman.

### Minor Research Project MNS Molecular Clinical Diagnostics

<b>Vakcode</b>	X_432711 (432711)
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	27.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	dr. H. Lingeman
<b>Examinator</b>	dr. H. Lingeman
<b>Niveau</b>	500

#### Doel vak

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.

#### Inhoud vak

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.

#### Doelgroep

mMNS

#### Overige informatie

For further information please contact Henk Lingeman.

### Minor Research Project MNS Molecular Clinical Diagnostics

<b>Vakcode</b>	X_432781 ()
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<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	33.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	dr. H. Lingeman
<b>Examinator</b>	dr. H. Lingeman
<b>Niveau</b>	500

#### Doel vak

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.

#### Inhoud vak

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.

#### Doelgroep

mMNS

#### Overige informatie

For further information please contact Henk Lingeman.

### Minor Research Project MNS Physics of Life

<b>Vakcode</b>	X_432709 (432708)
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	21.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	dr. S.M. Witte
<b>Examinator</b>	dr. S.M. Witte
<b>Niveau</b>	500

#### Overige informatie

Period: Variable

### Minor Research Project MNS Physics of Life

<b>Vakcode</b>	X_432717 ()
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	27.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	dr. S.M. Witte
<b>Examinator</b>	dr. S.M. Witte
<b>Niveau</b>	500



## Minor Research Project MNS Physics of Life

<b>Vakcode</b>	X_432783 ()
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	33.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	dr. S.M. Witte
<b>Examinator</b>	dr. S.M. Witte
<b>Niveau</b>	500

## MNS Major Research Project Molecular Clinical Diagnostics

<b>Vakcode</b>	X_432715 ()
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	39.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	dr. H. Lingeman
<b>Examinator</b>	dr. H. Lingeman
<b>Niveau</b>	600

### Doel vak

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.

### Inhoud vak

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.

### Doelgroep

mMNS

### Overige informatie

For further information please contact Henk Lingeman.

## MNS Major Research Project Molecular Clinical Diagnostics

<b>Vakcode</b>	X_432776 ()
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	45.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	dr. H. Lingeman
<b>Examinator</b>	dr. H. Lingeman

<b>Niveau</b>	600
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#### Doel vak

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.

#### Inhoud vak

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.

#### Doelgroep

mMNS

#### Overige informatie

For further information please contact Henk Lingeman.

### MNS Major Research Project Molecular Clinical Diagnostics

<b>Vakcode</b>	X_432777 ()
<b>Periode</b>	Ac. Jaar (september)
<b>Credits</b>	51.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	dr. H. Lingeman
<b>Examinator</b>	dr. H. Lingeman
<b>Niveau</b>	600

#### Doel vak

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.

#### Inhoud vak

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.

#### Doelgroep

mMNS

#### Overige informatie

For further information please contact Henk Lingeman.

### Omics-procedures in molecular clinical Diagnostics

<b>Vakcode</b>	X_432766 ()
<b>Periode</b>	Periode 5
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	dr. H. Lingeman

<b>Examinator</b>	dr. H. Lingeman
<b>Docent(en)</b>	dr. H. Lingeman
<b>Lesmethode(n)</b>	Hoorcollege
<b>Niveau</b>	400

### Doel vak

The primary objective of this course is highlighting the various omics-approaches that are used in drug- and biomarker discovery.

### Inhoud vak

Omic-approaches involve the comparison of metabolomes, proteomes and genomes between control and test groups to find differences in their profiles. Those differences may be correlated to the disease being studied in clinical biomarker discovery or changes in the metabolic output in toxicology studies. During the course the fundamentals and applications of omic-based techniques will be discussed. The focus will be on the separation (e.g. chromatography, electrophoresis), detection/identification (e.g. MS, NMR, Spectroscopic) and chemometric procedures to unravel complex biological and clinical samples

### Onderwijsvorm

Lectures and projects

### Literatuur

Hands-outs (electronically available)

### Doelgroep

mCH-AS, mDDS, mMNS

### Overige informatie

X\_432733 vervalt en is vervangen door X\_432766

## Parameter Estimation Applied to Medical and Biological Sciences

<b>Vakcode</b>	X_432631 (432631)
<b>Periode</b>	Periode 4
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	dr. J.C. de Munck
<b>Examinator</b>	dr. J.C. de Munck
<b>Docent(en)</b>	dr. J.C. de Munck
<b>Lesmethode(n)</b>	Hoorcollege
<b>Niveau</b>	500

### Doel vak

The course treats the theory of parameter estimation problems in general, but the theory is illustrated extensively by examples from medical and biological sciences and brain imaging (fMRI and MEG/EEG) in particular. Linear and non-linear regression analysis is treated, as well as confidence intervals and significance testing. The goal of the course is to provide insight into the theory of parameter estimation and to develop a critical attitude towards its application and

interpretation in order to avoid inconsistent and improper use of the theory.

### Inhoud vak

Linear-non linear parameter models, basic matrix-vector algebra, maximum likelihood principle, correlated-uncorrelated noise, OLS, GLS, nuisance parameters, linear (time invariant) filters, t-test, F-test, confidence intervals, fMRI data model, missing data, MEG/EEG source localisation. These topics are treated in the form of a series of lectures alternated with exercises.

Extra topics: L1 en L2 norms.

### Onderwijsvorm

Lecture.

### Toetsvorm

Written exam.

### Doelgroep

mMNS

## Pathofysiologie van hart en circulatie

<b>Vakcode</b>	AB_1015 ()
<b>Periode</b>	Periode 5
<b>Credits</b>	6.0
<b>Voertaal</b>	Nederlands
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	dr. E.C. Eringa
<b>Examinator</b>	dr. E.C. Eringa
<b>Docent(en)</b>	dr. E.C. Eringa
<b>Lesmethode(n)</b>	Hoorcollege, Werkgroep, Practicum, Werkcollege
<b>Niveau</b>	200

### Doel vak

Student inzicht verschaffen in het functioneren van het cardiovasculaire systeem, de pathogenese van hart- en vaatziekten en in de mogelijkheden die er zijn om therapeutisch in te grijpen.

Dit zal meer specifiek bestudeerd worden aan de hand van processen die kunnen leiden tot het ontstaan van het myocardinfarct en de herstelmogelijkheden, waarbij zowel de (micro)circulatie als het hart en hartfunctie aan bod komen.

### Inhoud vak

De cursus bestaat uit de volgende onderwerpen:

- Macrocirculatie en atherosclerose
- Microcirculatie en vasoregulatie
- Bloed en bloedstolling
- Hartfunctie en het myocardinfarct
- Angiogenese en arteriogenese

In het eerste onderdeel zullen de eigenschappen van macro- en microcirculatie aan bod komen, de regulatie van hun eigenschappen en de veranderingen in de vaatwand die kunnen leiden tot een verhoogde

bloeddruk en atherosclerose.

In het tweede onderdeel zal de werking van het hart op verschillende niveaus besproken worden en de afwijkingen die kunnen ontstaan en bedreigingen die op kunnen treden m.b.t. de hartfunctie, tenslotte leidend tot hartfalen.

In het derde onderdeel zal nader ingegaan worden op bloedsamenstelling, stolling en thrombusvorming.

In het vierde en laatste onderdeel wordt bekeken welke mogelijkheden er zijn, om na een myocardinfarct de hartfunctie te herstellen, met specifieke aandacht voor angiogenese en arteriogenese.

### Onderwijsvorm

- Colleges
- Werkgroepen (voorbereiden en bespreken opdrachten)
- Practica (op de laboratoria en in de practicumzaal van Fysiologie)
- Demonstraties (in de kliniek)
- Zelfstudie

### Toetsvorm

- Tentamen
- Essay/werkstuk

### Literatuur

Cardiophysiology concepts, 2nd edition, Richard E Klabunde.

### Aanbevolen voorkennis

Voldoende en aantoonbare kennis van de fysiologie en anatomie van het cardiovasculaire en respiratoire systeem (zoals bijv. BMW-cursus 'Mens als Systeem' of GZW cursus CRS)

### Doelgroep

Bachelorstudenten BMW, G&L, GZW, 2e jaar of hoger.

### Overige informatie

Studenten die de Master Cardiovascular Research gaan kiezen wordt aangeraden om deze cursus te volgen.

## Pathophysiology of Heart and Circulation

<b>Vakcode</b>	M_CPATHO09 (3120014)
<b>Periode</b>	Periode 1
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	VUmc
<b>Coördinator</b>	dr. W.S. Simonides
<b>Examinator</b>	dr. W.S. Simonides
<b>Lesmethode(n)</b>	Hoorcollege, Werkgroep
<b>Niveau</b>	400

### Doel vak

To gain knowledge of the most important cardiovascular concepts, theories, techniques, research questions and journals.

### Inhoud vak

This course focuses on the fundamental aspects of normal cardiac function, cardiac dysfunction and the development of heart failure. Basic information will be presented regarding anatomy and physiology of the heart and the circulation in health and disease.

The following topics will be addressed:

- cardiac contractile function
- circulation, blood pressure and fluid dynamics
- cardiac signal transduction and gene regulation
- cardiac remodelling and heart failure
- cardiomyopathies
- mitochondrial function in heart failure
- electrophysiology and arrhythmia
- endothelial heterogeneity
- vascular tone
- arteriosclerosis
- angiogenesis

### Onderwijsvorm

Lectures, working groups, assignments

### Literatuur

Book: Cardiology, Crawford-Di Marco-Paulus 3rd Ed.(recommended) syllabus including relevant articles.

Book: Pathophysiology of heart disease (Ed L.S. Lilly); syllabus including relevant articles.

### Intekenprocedure

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

## Physics of Organs 1: Cardio-Pulmonary Physics

<b>Vakcode</b>	X_428527 (428527)
<b>Periode</b>	Periode 1
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	prof. dr. ir. G.J.L. Wuite
<b>Examinator</b>	prof. dr. ir. G.J.L. Wuite
<b>Lesmethode(n)</b>	Hoorcollege
<b>Niveau</b>	400

### Inhoud vak

The course description is available on <http://studiegids.uva.nl/web/uva/sgs/en/c/144.html>

### Overige informatie

Opgave via <https://www.sis.uva.nl> tot 4 weken voor aanvang van het semester is verplicht

Course registration at the UVA is compulsory at least 4 weeks before the start of the semester via <https://www.sis.uva.nl>

## Physics of Organs 2: Sensory Organs and Bioelectricity

<b>Vakcode</b>	X_428528 (428528)
<b>Periode</b>	Periode 2
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Lesmethode(n)</b>	Hoorcollege
<b>Niveau</b>	400

### Inhoud vak

The course description is available via <http://studiegids.uva.nl/web/uva/sgs/en/c/145.html>

### Overige informatie

Opgave via <https://www.sis.uva.nl> tot 4 weken voor aanvang van het semester is verplicht

Course registration at the UVA is compulsory at least 4 weeks before the start of the semester via <https://www.sis.uva.nl>

## Policy, Politics and Participation

<b>Vakcode</b>	AM_470589 ()
<b>Periode</b>	Periode 2
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	C.A.C.M. Pittens MSc
<b>Examinator</b>	C.A.C.M. Pittens MSc
<b>Docent(en)</b>	dr. B.J. Regeer, dr. J.F.H. Kupper, prof. dr. J.E.W. Broerse
<b>Lesmethode(n)</b>	Hoorcollege, Werkgroep
<b>Niveau</b>	500

### Doel vak

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.

## Inhoud vak

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.

## Onderwijsvorm

Total course 6 EC = 160 hours  
lectures 14 hours  
training workshops 4 hours,  
project assignment 102 hours  
focus group execution 3 hours  
Self study 33 hours  
final presentations project results: 4 hours

## Toetsvorm

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%).

## Literatuur

To be announced on Blackboard

## Vereiste voorkennis

Basic knowledge of (interactive) policy processes, policy analysis and relevant research skills are required.

## Doelgroep

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

## Intekenprocedure

Registration deadline by VUnet is 4 weeks before the start of the course.

## Overige informatie

As the project depends on team work, attendance is compulsory.

## Praktijk I

<b>Vakcode</b>	O_MLPRAKI ()
<b>Periode</b>	Periode 1+2+3, Periode 4+5+6



<b>Credits</b>	15.0
<b>Voertaal</b>	Nederlands
<b>Faculteit</b>	Faculteit der Psychologie en Pedagogiek
<b>Coördinator</b>	ir. E.J.F. Scheringa
<b>Examinator</b>	ir. E.J.F. Scheringa
<b>Niveau</b>	500

### Doel vak

De student maakt kennis met het onderwijs in de praktijk, verzorgt lessen en is betrokken bij andere leerlinggerichte activiteiten. Hij kan binnen de context van de school theoretische inzichten praktisch vormgeven en weet de praktijkomgeving te benutten om aan eigen ontwikkelpunten te werken.

De student werkt samen met anderen binnen en buiten de school en kan zijn functioneren als teamlid beschrijven en toelichten.

### Inhoud vak

Het totale aantal klassencontacturen dat een student moet maken tijdens Praktijk 1 en 2, bedraagt tenminste 250. Tijdens deze uren observeert of verzorgt de student lessen en neemt deel aan andere leerlinggerichte activiteiten. Hij/zij geeft tenminste 120 lessen, waarvan minimaal 40 lesuren in de bovenbouw havo/vwo.

De verdeling en fasering van dit aantal uren over Praktijk 1 en 2 wordt in overleg met de begeleider op school bepaald. In Praktijk 1 ligt de nadruk op het observeren en het onder begeleiding voorbereiden, uitvoeren en evalueren van lessen.

Dit opleidingsonderdeel loopt parallel aan vakdidactiek 1 en algemene didactiek en pedagogiek 1, waardoor een goede wisselwerking mogelijk is tussen theorie en praktijk.

### Toetsvorm

Praktijk 1 wordt door de schoolbegeleider beoordeeld aan de hand van een checklist. De schoolbegeleider doet daarbij een voorstel dat door de instituutsbegeleider moet worden onderschreven.

### Vereiste voorkennis

Dit vak is alleen te volgen als onderdeel van de universitaire lerarenopleiding

## Praktijk II

<b>Vakcode</b>	O_MLPRAKII ()
<b>Periode</b>	Periode 1+2+3, Periode 4+5+6
<b>Credits</b>	15.0
<b>Voertaal</b>	Nederlands
<b>Faculteit</b>	Faculteit der Psychologie en Pedagogiek
<b>Coördinator</b>	ir. E.J.F. Scheringa
<b>Examinator</b>	ir. E.J.F. Scheringa
<b>Niveau</b>	500

### Doel vak

De student kan, als docent-in-opleiding, verantwoordelijkheid dragen voor het zelfstandig voorbereiden, uitvoeren en evalueren van lessen in de onder- en bovenbouw van het Havo/VWO. Hij kan tevens een bijdrage leveren aan schoolbrede activiteiten. Hij kan binnen de context van de school theoretische inzichten praktisch vormgeven en weet de praktijkomgeving te benutten om aan eigen ontwikkelpunten te werken. Hij kan reflecteren op opgedane ervaringen en verworven inzichten en deze op dusdanige manier beschrijven dat zij inzichtelijk worden voor anderen. De student toont zich professioneel in de samenwerking met anderen binnen en buiten de school en kan zijn functioneren als teamlid beschrijven en toelichten.

### Inhoud vak

Het totale aantal klassencontacturen dat een student moet maken tijdens Praktijk 1 en 2, bedraagt tenminste 250. Tijdens deze uren observeert of verzorgt de student lessen en neemt deel aan andere leerlinggerichte activiteiten. Hij/zij geeft tenminste 120 lessen, waarvan minimaal 40 lessen in de bovenbouw havo/vwo.

De verdeling en fasering van dit aantal uren over Praktijk 1 en 2 wordt in overleg met de begeleider op school bepaald. Tijdens Praktijk 2 draagt de student verantwoordelijkheid voor een of meer klassen. Hij bereidt het onderwijs voor, voert het uit en evalueert het. Hij werkt hierbij nadrukkelijk samen met sectiegenoten en andere collega's binnen de school en is zich bewust van de context waarin zijn lessen plaatsvinden. In het portfolio doet hij verslag van zijn functioneren als teamlid en collega in de school.

Dit opleidingsonderdeel loopt parallel aan vakdidactiek 2 en algemene didactiek en pedagogiek 2, waardoor een goede wisselwerking mogelijk is tussen theorie en praktijk.

### Toetsvorm

Praktijk 2 wordt door de schoolbegeleider beoordeeld aan de hand van een checklist waarop het eindcijfer voor de praktijk wordt gebaseerd. De schoolbegeleider doet daarbij een voorstel dat door de instituutsbegeleider moet worden onderschreven.

Tevens beoordeelt schoolbegeleider het functioneren van de student als teamlid en collega op basis van de door de student uitgevoerde portfolio-opdrachten.

### Vereiste voorkennis

Dit vak is alleen te volgen als onderdeel van de universitaire lerarenopleiding.

## Professionele ontwikkeling en onderzoek I

<b>Vakcode</b>	O_MLVPOOI ()
<b>Periode</b>	Periode 1+2+3, Periode 4+5+6
<b>Credits</b>	3.0
<b>Voertaal</b>	Nederlands
<b>Faculteit</b>	Faculteit der Psychologie en Pedagogiek

<b>Docent(en)</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. S. Attema-Noordewier, drs. W. Jongejan, dr. H.B. Westbroek, dr. E. van den Berg, C.L. Geraedts, drs. A. Krijgsman, prof. dr. J.J. Beishuizen, dr. A.A. Kaal, dr. J.J.M. van Eersel, drs. K.L. Schaap, W. Maas, drs. G.D. van Hummel, F.L. de Vries MSc, drs. H. Stouthart
<b>Lesmethode(n)</b>	Hoorcollege, Werkcollege
<b>Niveau</b>	500

### Doel vak

De student kan systematische reflecteren op het eigen handelen in de onderwijspraktijk en daardoor richting geven aan de eigen professionele ontwikkeling.

De student kan een onderzoeksvraag formuleren voor een onderzoek aan zijn/haar eigen onderwijspraktijk, deze vraag inbedden in een theoretisch kader en een opzet maken voor de uitvoering van het onderzoek.

### Inhoud vak

Dit vak bestaat uit twee delen: een reflectiedeel en een onderzoeksdeel. Het reflectiedeel krijgt vorm en inhoud in zogenaamde peergroepbijeenkomsten. Hierin reflecteert de studenten samen met anderen op zijn/haar handelen in de praktijk en leert daaruit ontwikkelpunten af te leiden, acties te formuleren en deze te evalueren. Verschillende instrumenten en methodes worden gebruikt (logboek, reflectiecirkel, intervisie,...) om de student in staat te stellen de complexiteit van de onderwijspraktijk te doorgronden en hiervan te leren. Daarnaast wordt een start gemaakt met het formuleren van de eigen visie op onderwijs en leren.

In het onderzoeksdeel wordt een opzet gemaakt van een praktijkonderzoek. In dit onderzoek diept de student één of meer vraagstukken uit de (eigen) onderwijspraktijk uit, waarbij een onderzoeksvraag ingebed wordt in een theoretisch kader en op één of enkele scholen empirisch materiaal wordt verzameld. In plenaire bijeenkomsten komen onderwerpen aan de orde als het formuleren van de probleemstelling en de onderzoeksvraag, het verkennen van de literatuur en het verzamelen van de data. Daarnaast kan de student beroep doen op individuele begeleiding rondom zijn/haar onderzoek. Dit alles mondt uit in een eerste onderzoeksformat voor het praktijkonderzoek dat vervolgens in het vak Professionele Ontwikkeling en Onderzoek 2 uitgevoerd, gepresenteerd en geëvalueerd wordt.

### Onderwijsvorm

colleges, werkgroepbijeenkomsten en individuele begeleiding van het onderzoek door instituutsbegeleiders.

### Toetsvorm

Uitvoeren van opdrachten.

### Literatuur

Een literatuurlijst wordt verstrekt aan het begin van de opleiding.

### Vereiste voorkennis

Dit vak is alleen te volgen als onderdeel van de universitaire lerarenopleiding.

## Overige informatie

Voor alle onderdelen geldt een aanwezigheidsplicht.

## Professionele ontwikkeling en onderzoek II

<b>Vakcode</b>	O_MLVPOOII ()
<b>Periode</b>	Periode 1+2+3, Periode 4+5+6
<b>Credits</b>	6.0
<b>Voertaal</b>	Nederlands
<b>Faculteit</b>	Faculteit der Psychologie en Pedagogiek
<b>Coördinator</b>	dr. H.B. Westbroek
<b>Examinator</b>	dr. H.B. Westbroek
<b>Docent(en)</b>	dr. C.P. van Velzen, drs. W. Jongejan, dr. T. Bosma, dr. H.B. Westbroek, dr. E. van den Berg, dr. A.A. Kaal, dr. J.J.M. van Eersel, dr. A. Handelzalts, W. Maas
<b>Lesmethode(n)</b>	Hoorcollege, Werkcollege
<b>Niveau</b>	500

### Doel vak

De student kan een praktijkonderzoek opzetten, uitvoeren en hierover rapporteren.

### Inhoud vak

Dit vak bestaat uit twee delen: een reflectiedeel en een onderzoeksdeel. Het reflectiedeel krijgt vorm en inhoud in begeleide en zelfstandige intervisiegroepen waarin studenten reflecteren op hun praktijk aan de hand van cases en eigen videobeelden. Daarnaast formuleren de studenten in dit deel hun visie op onderwijs en leren.

In het praktijkonderzoeksdeel diept de student in samenwerking met een medestudent één of meer vraagstukken uit de (eigen) onderwijspraktijk uit. Hij of zij doet dat door het samen opzetten, uitvoeren en evalueren van een op de eigen onderwijspraktijk gericht onderzoek waarbij op één of enkele scholen empirisch materiaal wordt verzameld. Aan de hand van de opzet die deels gemaakt is tijdens de module Professionele Ontwikkeling en Onderzoek 1 en deels in POO 2 ontwerpen studenten onderzoeksinstrumenten om empirisch gegevens te verzamelen voor het beantwoorden van de onderzoeksvraag en voeren zij het onderzoek uit.

Voordat het onderzoeksplan mag worden uitgevoerd, moet het worden goedgekeurd door de eerste en tweede beoordelaar.

In een artikel voor collega docenten rapporteren studenten over het onderzoek waarin aan de orde komen vraagstelling, relevantie, verankering in bestaande theorie, gebruikte instrumenten, data, conclusie en discussie. De studenten presenteren ook hun onderzoek tijdens de Onderwijsresearchdag.

### Onderwijsvorm

Onderzoek, verplichte deelname aan hoorcolleges praktijkonderzoek en werkcollege, intervisiebijeenkomsten, individuele begeleiding door instituutsbegeleiders.

### Toetsvorm

De rapportage van het praktijkonderzoek vindt plaats in de vorm van een posterpresentatie en een artikel voor een vaktijdschrift voor leraren.

Het artikel wordt gezamenlijk beoordeeld door de eerste begeleider en tweede lezer, die wordt aangezocht door de eerste begeleider. De presentatie van het onderzoek op de Onderwijsresearchdag wordt meegenomen in de eindbeoordeling. Ook de mate van zelfstandigheid in het opzetten, uitvoeren en rapporteren van het onderzoek wordt beoordeeld

### Literatuur

Een literatuurlijst wordt verstrekt aan het begin van de opleiding.

### Vereiste voorkennis

Dit vak is alleen te volgen als onderdeel van de universitaire lerarenopleiding.

Om dit vak te volgen moet het vak Professionele Ontwikkeling en Onderzoek 1 met goed gevolg zijn afgelegd.

### Overige informatie

Voordat het onderzoeksplan mag worden uitgevoerd, moet het worden goedgekeurd door de eerste en tweede beoordelaar.

Voor alle onderdelen geldt een aanwezigheidsplicht.

## Qualitative and Quantitative Research Methods

<b>Vakcode</b>	AM_470582 ()
<b>Periode</b>	Periode 1
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	dr. J.F.H. Kupper
<b>Examinator</b>	dr. J.F.H. Kupper
<b>Docent(en)</b>	dr. H. Wels, dr. B.J. Regeer, dr. J.F.H. Kupper
<b>Lesmethode(n)</b>	Hoorcollege, Werkgroep, Computerpracticum
<b>Niveau</b>	400

### Doel vak

- Understanding the differences between beta- and gamma research;
- To acquire insight and understanding of a real world research process. This includes 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 and their underlying theoretical concepts;
- To understand the relative strengths and weaknesses of the various research methods;
- To know how to interpret quantitative and qualitative findings;
- To be able to make an adequate research design for the investigation of a specific complex societal problem.

### Inhoud vak

Contemporary societies increasingly face complex social problems, like climate change, HIV/ AIDS or ethnic and religious diversity . These complex problems involve a variety of social actors: policy-makers,

professionals, NGOs, industry, science and of course the public at large. Addressing such 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: questionnaires, systematic observations using all the senses, surveys and statistics, semi-structured in-depth interviews, as well as 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. Throughout the course, you will apply theoretical knowledge about the various research methodologies in the training of different qualitative and quantitative methods, and in making a research design. In small groups, you are trained in: (1) qualitative research methods such as semi structured interviews and observation techniques, (2) quantitative research methods such as questionnaires, 3) analysis of the data, and (4) writing a research design.

### Onderwijsvorm

Lecture (20h), Training workshops (34h), Research project (107h), Examination (3h).

### Toetsvorm

Group assignment (50%) and exam (50%). Both parts need to be graded 6 or higher.

### Literatuur

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, Los Angeles. ISBN 978-1-4462-6019-7

### Doelgroep

Compulsory course in the Master programme Management, Policy Analysis and Entrepreneurship for the Health and Life Sciences (MPA) and compulsory course within the Science communication- and Societal differentiations of Health, Life and Natural Sciences Masters programmes.

### Overige informatie

Attendance of training workshops is compulsory. For further information please contact Marlous Arentshorst: [m.e.arentshorst@vu.nl](mailto:m.e.arentshorst@vu.nl)

## Science and Communication

<b>Vakcode</b>	AM_470587 ()
<b>Periode</b>	Periode 1
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	dr. B.J. Regeer
<b>Examinator</b>	dr. B.J. Regeer

<b>Docent(en)</b>	dr. B.J. Regeer, dr. J.F.H. Kupper, B.M. Tielemans, P. Klaassen MA
<b>Lesmethode(n)</b>	Hoorcollege, Werkgroep
<b>Niveau</b>	500

### Doel vak

- 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).

### Inhoud vak

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.

### Onderwijsvorm

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

### Toetsvorm

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

### Literatuur

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

### Doelgroep

The course Science and Communication is a compulsory course for students of the Master specialisation Science Communication (Wetenschapscommunicatie) and is a prerequisite for the internship. Science and Communication is an optional course for students from other

master programs in the health and life sciences.

## Science in Dialogue

<b>Vakcode</b>	AM_1002 ()
<b>Periode</b>	Periode 2
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	dr. J.F.H. Kupper
<b>Examinator</b>	dr. J.F.H. Kupper
<b>Docent(en)</b>	dr. J.F.H. Kupper
<b>Lesmethode(n)</b>	Werkgroep, Hoorcollege
<b>Niveau</b>	500

### Doel vak

To gain knowledge of and insight into:

- the basic concepts and issues in the understanding of science-society interactions, both from a philosophical 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

### Inhoud vak

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.

### Onderwijsvorm

Lectures (14h), Workgroups (28h), Training workshops (24h), Selfstudy, (82h), Dialogue presentations (12h)

### Toetsvorm

Group assignment (50%), Take home exam (30%), Reflection report (20%). All assignments must be passed (grade > 6).

### Literatuur

Is announced on blackboard one month before start of the course

### Doelgroep

Optional course in the MSc specialization Science Communication

### Overige informatie

Independence and a cooperative attitude is expected. Attendance to training workshops is mandatory.

## Science Journalism

<b>Vakcode</b>	AM_471014 ()
<b>Periode</b>	Periode 2
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	dr. J.F.H. Kupper
<b>Examinator</b>	dr. J.F.H. Kupper
<b>Docent(en)</b>	dr. J.F.H. Kupper, W.J. Breukers MSc, dr. M.J.W. Bos
<b>Lesmethode(n)</b>	Hoorcollege, Werkgroep, Computerpracticum
<b>Niveau</b>	500

### Doel vak

To acquire knowledge of and insight into:

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

To acquire skills in:

- writing popular scientific texts for different genres such as news, background and interview
- designing science communication for different media such as newspaper, radio and internet

Orientation to the professional practice of science journalism

### Inhoud vak

This course teaches the basic principles of science journalism. A series of interactive lectures reviews both the practical as well as the theoretical aspects of science journalism. Topics that are discussed are the translation of science to a language that is both compelling and understandable, the role of journalism in the interaction between science and society, images of science in the media and the ethics of science journalism. The interactive lectures invite you to take your own 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, interviewing, conceptual analysis and program design.

### Onderwijsvorm

Lectures and seminars on theory and practice of science journalism and writing skill training (36h). Considerable time is set aside for performing science journalism in assignments (108h). The assignments are assessed by lecturers and fellow students (peer-review process). Self study (16h).

### Toetsvorm

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

### Literatuur

Announced on Blackboard one month before start of the course

### Doelgroep

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

### Overige informatie

Course is taught in Dutch. More information: [f.kupper@vu.nl](mailto:f.kupper@vu.nl).

## Science Museology

<b>Vakcode</b>	AM_470590 ()
<b>Periode</b>	Periode 3
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Fac. der Aard- en Levenswetenschappen
<b>Coördinator</b>	dr. B.J. Regeer
<b>Examinator</b>	dr. B.J. Regeer
<b>Docent(en)</b>	dr. B.J. Regeer, drs. ir. M.G. van der Meij
<b>Lesmethode(n)</b>	Hoorcollege, Werkgroep
<b>Niveau</b>	500

### **Doel vak**

- 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 on adjustments and/or development of exhibitions.
- Gain experience in working for an external commissioner.

### **Inhoud vak**

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.

### **Onderwijsvorm**

Lectures (14 h)

Workgroups (40 h)

Home-study for group assignments (64 h)

Home-study for individual assignments (32 h)

### **Toetsvorm**

Group assignment (40%), presentations (poster and oral) (10%), and exams (take-home and written) (50%). For the assignments, presentations and all exams a pass-grade must be obtained.

### **Literatuur**

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

### **Vereiste voorkennis**

Bachelor in any of the Beta Sciences

### **Doelgroep**

Optional course in the C-differentiations (Science Communication) 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.

### **Overige informatie**

Guest lectures from and excursions to for instance Artis, NEMO, Naturalis, NorthernLight, Museon, etc.

## **Scientific Writing in English for Medical Natural Sciences**

<b>Vakcode</b>	X_420563 ()
<b>Periode</b>	Periode 3
<b>Credits</b>	3.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	M. van den Hoorn
<b>Examinator</b>	M. van den Hoorn
<b>Lesmethode(n)</b>	Hoorcollege
<b>Niveau</b>	400

### Doel vak

The aim of this course is to provide the writing student with the essential linguistic means for producing English academic texts which are effective, idiomatically and stylistically appropriate and grammatically correct.

### Inhoud vak

The initial focus in the course lies on the form of scientific texts in the Exact Sciences:

- Abstract (or summary)
- Introduction
- Methods
- Results
- Discussion

#### General course outline

Introducing the topics

- Academic and technical writing in English
- The characteristics of different kinds of scientific texts
- How scientific writing is judged and assessed
- Where do you find your information and how do you present it?
- How to avoid committing plagiarism

Who am I writing for? What do I want to say?

- Your readership
- Key parts of an academic article: title, abstract, introduction, methods, results and discussion

Writing the actual article

- Paragraph and sentence construction: how do I link paragraphs together?
- Writing simple and complex sentences. Active and passive sentences.
- Argumentation : how do I put an argument? How do I frame my own opinion?

Should I use "I" or "we"?

Writing correct English

- Use of apostrophes and colons
- Word order, verb tenses, time and tense
- Avoiding mistakes typically made by Dutch writers
- Common spelling mistakes

You will be making considerable use of peer assessment: examining fellow students' written work and giving them feedback. This method provides useful insights into how a text might be improved. The process of providing someone else with feedback on their text is something that you will find very instructive.

### Onderwijsvorm

The course is focused on self-tuition. The plenary sessions concentrate on the process of writing and the product of writing. Homework is part of the course. With each topic, participants work through a phased series of exercises that usually conclude with the requirement to write a short piece of text. The instructor will append extensive written remarks to this text.

### Toetsvorm

There will be no examination. However, students will receive their credits only when they have participated in all classes (presence is obligatory) and also when they have handed in the assignments satisfactorily. Students will receive a 'pass' when they have finished the course.

### Literatuur

For this course you need the book Effective Scientific Writing: an advanced learner's guide to better English (A. Bolt & W. Bruins, ISBN 978 90 8659 6171). This book can be obtained at the VU bookstore, which is located in the VU main building. The costs are € 27,95 per book. For questions contact the Taalcentrum-VU at 020 - 598 9804.

### Aanbevolen voorkennis

Bachelor Exact Sciences.

### Doelgroep

mMNS

## Signal Transduction in Health and Disease

<b>Vakcode</b>	X_432535 (432535)
<b>Periode</b>	Periode 2
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	prof. dr. M.J. Smit
<b>Examinator</b>	prof. dr. M.J. Smit
<b>Docent(en)</b>	dr. M.J. Smit
<b>Lesmethode(n)</b>	Hoorcollege
<b>Niveau</b>	600

### Doel vak

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.

### Inhoud vak

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.

### Onderwijsvorm

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.

### Toetsvorm

Assignment and presentation, written exam.

### Literatuur

Marks e.a., Cellular Signal Processing. Garland Sci (ISBN 0-8153-4215-2).

Papers available on Blackboard

### Aanbevolen voorkennis

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

### Doelgroep

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

## Soft Condensed Matter and Biological Physics

<b>Vakcode</b>	X_420167 (420167)
<b>Periode</b>	Periode 2
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	prof. dr. ir. G.J.L. Wuite
<b>Examinator</b>	prof. dr. ir. G.J.L. Wuite
<b>Docent(en)</b>	prof. dr. ir. G.J.L. Wuite
<b>Lesmethode(n)</b>	Hoorcollege
<b>Niveau</b>	400

### Doel vak

To provide insight into the physics of biological systems and soft condensed matter. In addition we will discuss and illustrate recent examples of the scientific literature in this field.

### Inhoud vak

- The building blocks of cells.
- Statistical physics applied to soft-condensed matter.
- Random Walks, Friction and Diffusion.
- Life at low Reynolds number.
- Entropic forces at work.
- Chemical forces & self-assembly.
- The cytoskeleton, a semiflexible, crosslinked polymer network.
- Enzymes and molecular machines.
- Molecular motor proteins, the lorries in our cells.

**Onderwijsvorm**

Lectures, and self-study.

**Toetsvorm**

Homework, Scientific literature presentations and an exam.

**Literatuur**

Nelson, P., Biological Physics, Energy, Information, Life. New York: W.H. Freeman and Company, 2004 (ISBN 0-7167-4372-8).

**Doelgroep**

mMNS, mPhys-AMEP, mPhys-PLH

## Statistical Theory of Complex Molecular Systems

<b>Vakcode</b>	X_428520 (428520)
<b>Periode</b>	Periode 1
<b>Credits</b>	6.0
<b>Voertaal</b>	Engels
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Niveau</b>	400

**Inhoud vak**

The course description is available on

<http://studiegids.uva.nl/web/uva/sgs/nl/c/10917.html>

**Doelgroep**

mMNS-PoL, mPhys-LSBP, mPhys-PLH, mCh-MSP

**Overige informatie**

Course registration at the UVA is compulsory at least 4 weeks before the start of the semester via <https://www.sis.uva.nl>

## Vakdidactiek Natuurkunde I

<b>Vakcode</b>	O_MLVDNAI ()
<b>Periode</b>	Periode 1+2, Periode 4+5
<b>Credits</b>	3.0
<b>Voertaal</b>	Nederlands
<b>Faculteit</b>	Faculteit der Psychologie en Pedagogiek
<b>Coördinator</b>	dr. E. van den Berg
<b>Examinator</b>	dr. E. van den Berg
<b>Docent(en)</b>	dr. H.B. Westbroek, dr. E. van den Berg, F.L. de Vries MSc
<b>Lesmethode(n)</b>	Werkcollege
<b>Niveau</b>	500

**Doel vak**

De student kan vakinhoudelijke en vakdidactische kennis, vaardigheden en inzichten vertalen naar de eigen vaklessen.

**Inhoud vak**

Tijdens de vakdidactiekcolleges maakt de student kennis met de inhoud en didactiek van het schoolvak en leert deze inzichten in de praktijk vorm te geven. Er is aandacht voor vakspecifieke kennis en vaardigheden en de voor het schoolvak relevante ICT-toepassingen. In het vakdidactiekprogramma vindt eveneens een vertaling plaats van algemeen didactische thema's naar het vak. De leservaringen op school spelen hierbij een belangrijke rol.

**Onderwijsvorm**

Werkcolleges

**Toetsvorm**

Beoordeling van het portfolio

**Literatuur**

Een literatuurlijst wordt verstrekt aan het begin van de opleiding

**Vereiste voorkennis**

Dit vak is alleen te volgen als onderdeel van de universitaire lerarenopleiding

**Overige informatie**

Er geldt een aanwezigheidsplicht

**Vakdidactiek Natuurkunde II**

<b>Vakcode</b>	O_MLVDNAII ()
<b>Periode</b>	Periode 1+2, Periode 4+5
<b>Credits</b>	6.0
<b>Voertaal</b>	Nederlands
<b>Faculteit</b>	Faculteit der Psychologie en Pedagogiek
<b>Coördinator</b>	dr. E. van den Berg
<b>Examinator</b>	dr. E. van den Berg
<b>Docent(en)</b>	dr. H.B. Westbroek, dr. E. van den Berg, F.L. de Vries MSc
<b>Lesmethode(n)</b>	Werkcollege
<b>Niveau</b>	500

**Doel vak**

De student kan vakinhoudelijke en vakdidactische kennis, vaardigheden en inzichten vertalen naar de eigen vaklessen en zijn aanpak verantwoorden.

**Inhoud vak**

De tijdens Vakdidactiek 1 opgedane kennis en vaardigheden worden in Vakdidactiek 2 verder uitgebreid en verdiept. In dit semester ligt het accent op het zelfstandig vormgeven van een samenhangende lessenserie gericht op de bovenbouw van het Voortgezet Onderwijs, die inhoudelijk en vakdidactisch verantwoord moet worden.

**Onderwijsvorm**

Werkcolleges

**Toetsvorm**



Beoordeling van het portfolio

### Literatuur

Een literatuurlijst wordt verstrekt aan het begin van de opleiding

### Vereiste voorkennis

Dit vak is alleen te volgen als onderdeel van de universitaire lerarenopleiding

Reguliere studenten dienen eerst Vakdidactiek 1 afgerond te hebben alvorens aan Vakdidactiek 2 kan worden deelgenomen. Voor instromers (studenten met een tweedegraads bevoegdheid en een master in het Schoolvak) geldt deze verplichting niet.

### Overige informatie

Er geldt een aanwezigheidsplicht

## Vakdidactiek Scheikunde I

<b>Vakcode</b>	O_MLVDSKI ()
<b>Periode</b>	Periode 1+2, Periode 4+5
<b>Credits</b>	3.0
<b>Voertaal</b>	Nederlands
<b>Faculteit</b>	Faculteit der Psychologie en Pedagogiek
<b>Coördinator</b>	dr. H.B. Westbroek
<b>Examinator</b>	dr. H.B. Westbroek
<b>Docent(en)</b>	dr. H.B. Westbroek, dr. E. van den Berg, F.L. de Vries MSc
<b>Lesmethode(n)</b>	Werkcollege
<b>Niveau</b>	500

### Doel vak

De student maakt kennis met de inhoud en didactiek van het schoolvak en leert deze inzichten in de praktijk vorm te geven.

### Inhoud vak

De colleges van vakdidactiek I bieden een inleiding in het schoolvak en de lesmethoden, met aandacht voor lesplan en toetsing. Er is ook aandacht voor vakspecifieke kennis en vaardigheden en de voor het schoolvak relevante ICT-toepassingen. In het vakdidactiekprogramma vindt eveneens een vertaling plaats van algemeen didactische thema's naar het vak. De leservaringen op school spelen hierbij een belangrijke rol.

### Onderwijsvorm

Interactieve hoor- en werkcolleges

### Toetsvorm

Beoordeling op basis van ingeleverde portfolio-opdrachten

### Literatuur

Een syllabus wordt op het eerste college uitgereikt

### Vereiste voorkennis

Dit vak is alleen te volgen als onderdeel van de universitaire lerarenopleiding

### Overige informatie

Er geldt een aanwezigheidsplicht

## Vakdidactiek Scheikunde II

<b>Vakcode</b>	O_MLVDSKII ()
<b>Periode</b>	Periode 1+2, Periode 4+5
<b>Credits</b>	6.0
<b>Voertaal</b>	Nederlands
<b>Faculteit</b>	Faculteit der Psychologie en Pedagogiek
<b>Coördinator</b>	dr. H.B. Westbroek
<b>Examinator</b>	dr. H.B. Westbroek
<b>Docent(en)</b>	dr. H.B. Westbroek, dr. E. van den Berg, F.L. de Vries MSc
<b>Lesmethode(n)</b>	Werkcollege
<b>Niveau</b>	500

### Doel vak

De student kan vakinhoudelijke en vakdidactische kennis, vaardigheden en inzichten vertalen naar de eigen vaklessen.

### Inhoud vak

De colleges van vakdidactiek II bieden een voortzetting van de schoolvakspecifieke vakdidactiek. De belangrijkste opdracht is het ontwerp en de uitvoering van een lessenserie van 3 lessen, die inhoudelijk en vakdidactisch verantwoord moet worden.

### Onderwijsvorm

Interactieve hoor- en werkcolleges

### Toetsvorm

Beoordeling op basis van ingeleverde portfolio-opdrachten

### Literatuur

Een syllabus wordt op het eerste college uitgereikt

### Vereiste voorkennis

Vakdidactiek I, Algemene didactiek en pedagogiek I, Praktijk I

### Overige informatie

Er geldt een aanwezigheidsplicht

## Verdieping

<b>Vakcode</b>	O_MLVERD ()
<b>Periode</b>	Periode 2+3, Periode 5+6
<b>Credits</b>	3.0
<b>Voertaal</b>	Nederlands
<b>Faculteit</b>	Faculteit der Psychologie en Pedagogiek

<b>Docent(en)</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, dr. E. van den Berg, C.L. Geraedts, drs. A. Krijgsman, dr. J.J.M. van Eersel, drs. K.L. Schaap, W. Maas, drs. G.D. van Hummel, F.L. de Vries MSc, drs. H. Stouthart, drs. I. Pauw, drs. C.D.P. van Oeveren
<b>Lesmethode(n)</b>	Werkcollege,
<b>Niveau</b>	500

### Doel vak

1. De student verdiept zich in een onderdeel binnen zijn of haar schoolvak of cluster.
2. De student is zich bewust van zijn of haar rol als docent in een pluriforme samenleving.
3. De student kan verschillende aspecten van diversiteit in het onderwijs benoemen en aangeven in hoeverre deze aspecten in zijn of haar eigen schoolvak een rol spelen.

### Inhoud vak

Binnen de clusters en vakken worden (verplichte) verdiepingsmodulen aangeboden. Daarnaast volgt elke student het onderdeel diversiteit, waarin een aantal aspecten van onderwijs in een pluriforme samenleving aan bod komen:

1. Wat betekent identiteitsontwikkeling in een door diversiteit gekenmerkte samenleving?
2. Wat is de zin en onzin van diversiteitsgevoelig onderwijs?
3. Wat zijn de verschillende thematieken van diversiteit in de klas?
4. Wat is er bekend uit onderzoek over diversiteit in de onderwijspraktijk?

### Onderwijsvorm

Hoorcollege, werkcollege.

### Toetsvorm

Analyse van een casus.

### Literatuur

Syllabus met artikelen wordt verstrekt.

## Voortgezette Biostatistiek

<b>Vakcode</b>	X_401078 ()
<b>Periode</b>	Periode 4
<b>Credits</b>	3.0
<b>Voertaal</b>	Nederlands
<b>Faculteit</b>	Faculteit der Exacte Wetenschappen
<b>Coördinator</b>	dr. W.N. van Wieringen
<b>Examinator</b>	dr. W.N. van Wieringen
<b>Docent(en)</b>	dr. W.N. van Wieringen
<b>Lesmethode(n)</b>	Hoorcollege, Werkcollege
<b>Niveau</b>	400

**Doel vak**

Het bekend raken met statistische begrippen en technieken die een rol spelen in het modelleren en analyseren van processen op het moleculaire niveau van de cel. Onder andere Markov modellen, regressie modellen, en Gaussische graphische modellen komen aan bod. Naast het modelleren wordt aandacht besteed aan het schatten van de model parameters aan de hand van data. Uiteindelijk dient de student zelfstandig bovengenoemde statistische analyse uit te kunnen voeren alsmede die van derden kritisch te beoordelen.

**Inhoud vak**

Het college valt in twee stukken uit, qua toepassing, data type (discreet vs. continue), en modellen en technieken.

Echter, in beide college-stukken worden processen in de cel gemodelleerd. Een gebeurtenis in de cel staat niet op zichzelf, maar is verweven met de rest van de cel. In dit gehele college deel worden deze afhankelijkheden gemodelleerd. Waar mogelijk worden voorbeelden afkomstig uit het VUmc ziekenhuis gebruikt om de statistische technieken te illustreren.

In het eerste stuk van dit college-deel staat het modelleren van de DNA sequentie centraal. Resulterende modellen worden aangewend om de evolutie van een kankercel te beschrijven. Of, middels hidden Markov modellen wordt de exon-intron structuur van een gen te ontrafeld. Maar ook wordt de evolutie van het DNA beschreven om vervolgens phylogenetische bomen (afstammingsbomen) te reconstrueren.

In het tweede stuk wordt mbv verschillende technieken gepoogd de topologische structuur van het regulatoire netwerk van de cel (een pathway) te reconstrueren op basis van gen expressie data. Dat wil zeggen, kunnen we achterhalen welk gen met welk gen samenwerkt in de cel?

**Onderwijsvorm**

Combinatie van hoor- en werkcollege.

**Toetsvorm**

Schriftelijk tentamen.

**Literatuur**

- 1) Diktaat deels geschreven door de docent alswel bestaande uit hoofdstukken van boeken van derden.
- 2) College slides.

**Vereiste voorkennis**

Aanbevolen voorkennis: Biostatistiek 1 en 2 voor MNW.

**Doelgroep**

3MNW

**Overige informatie**

Dit vak komt in plaats Biostatistiek X\_401057.