Biomolecular Sciences MSc

Vrije Universiteit Amsterdam - Fac. der Aard- en Levenswetenschappen - M Biomolecular Sciences - 2013-2014

The aim of the Master programme Biomolecualr Sciences to equip the student with the knowledge, skills and insight required to operate as an independent professional within the field of biomolecular sciences and to be a suitable candidate for a subsequent course of study leading to a career in research. Having completed the programme, the student should have developed a critical scientific approach and an awareness of the ethical and societal aspects of biomolecular sciences.

The programme is intended for students with a research-oriented profile. It trains students with bachelors ranging from biomedical sciences and biology to (bio)chemistry, physics, mathematics and engineering, for a Master's degree at the interface between these disciplines. Also medical and veterinary doctors, dentists, pharmacists/pharmaceutical scientists can enter the programme. The focus is on the issue how molecules lead to biological function in health and disease. It therewith covers genetics, microbiology, structural biology, cell physiology, molecular biology, biochemistry, biophysics, biomathematics, genomics, bioinformatics, pharmacology, toxicology, spectroscopy, immunology and infection.

The programme offers a choice between two specializations:

-Molecular Cell Biology
-Biological Chemistry

The year schedule 2013 - 2014 can be found at the FALW-website .
Further information about the MSc programme Biomolecular Sciences.
A complete programme description can be found at the FALW-website .

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Expired programme components Biomolecular Sciences

Courses:

Name	Period	Credits	Code
History of Life Sciences	Ac. Year (September), Period 3	3.0	AM_471017

MSc Biomolecular Sciences, spec. Biological Chemistry

In this specialisation we focus on the interaction of cells, cellular structures and individual proteins with their "chemical environment". Special focus will lie on the characterization of new drug targets and tools to find small molecules as leads in the development of new medicines. Furthermore, the bioactivation of and cellular responses to drugs will get special attention.
The Masters specialisation Biological Chemistry is organized by Medicinal Chemistry and Molecular Toxicology of the Department of Chemistry and Pharmaceutical Sciences of the Faculty of Sciences (FEW).

This programme gives a thorough grounding in the subjects and methods of the Medicinal Chemistry and Molecular Toxicology as well as providing a solid preparation for one or more research internships.

Capita Selecta are offered on individual basis throughout the year.

Opleidingsdelen:

- keuzecursussen jaar 1
- verplichte cursussen jaar 1
- kies een van beide cursussen
- cursussen jaar 2 (verplicht en keuze)

keuzecursussen jaar 1

Vakken:

Naam	Periode	Credits	Code
Biomolecular Screening	Periode 4	3.0	X_432542
Biophotonics I: Microspectroscopy	Periode 3	3.0	AM_470629
Biophotonics III: Practical Training	Periode 3	3.0	AM_470630
Computational Design and Synthesis of Drugs		6.0	X_435673
Molecular Biology Techniques	Periode 3	3.0	X_432540
Molecular Pharmacology	Periode 4	3.0	X_432541

Protein Sciences Techniques	Periode 3	3.0	AM_470641

verplichte cursussen jaar 1

Vakken:

Naam	Periode	Credits	Code
Genomes and Gene Expression	Periode 1	6.0	AM_470614
Internship I Biological Chemistry	Ac. Jaar (september)	30.0	AM_471129
Protein Science	Periode 1	6.0	AM_470145
Scientific Writing in English	Ac. Jaar (september)	3.0	AM_471023

kies een van beide cursussen

Vakken:

Naam	Periode	Credits	Code
Drug-induced Stress and Cellular Responses	Periode 2	6.0	X_432536
Signal Transduction in Health and Disease	Periode 2	6.0	X_432535

cursussen jaar 2 (verplicht en keuze)

Vakken:

Naam	Periode	Credits	Code
Business and Innovation in Life Science	Periode 1, Periode 3	3.0	X_432539
Caput Microbial Genomics	Ac. Jaar (september)	3.0	AM_1021
Chemical Biology	Periode 1	6.0	X_432538
Dynamics of Biomolecules and Cells	Periode 4	6.0	X_422583
Ethics in Life Sciences	Periode 3	3.0	AM_470707
Internship II Biological Chemistry	Ac. Jaar (september)	30.0	AM_471130
Project Computational Design and Synthesis of Drugs	Periode 4	6.0	X_432734
Structural Bioinformatics	Periode 4	6.0	X_405019

Thesis Based on Literature Study	Ac. Jaar (september)	9.0	AM_471153

MSc Biomolecular Sciences, spec. Molecular Cell Biology

With the Masters Biomolecular Sciences specialisation Molecular Cell Biology, students can further develop their skills and performance in molecular and cellular research and prepare themselves for an (inter) national research position. The Masters programme Molecular Cell Biology has been developed for students with a Bachelors degree in Biology or Biomedical Sciences or any other relevant Bachelor's degree (for instance Biochemistry or HLO) and is organized by the Institute for Molecular Cell Biology (IMC) of the Faculty of Earth and Life Sciences (FALW) in collaboration with the Faculty of Sciences of the VU University Amsterdam and the VU Medical Center (VUmc).

This programme gives a thorough grounding in the subjects and methods of the Department of Molecular Cell Biology (MCB), as well as providing a solid preparation for one or more research internships.

Opleidingsdelen:

- keuzecursussen jaar 1 (nader)
- verplichte cursussen jaar 1
- kies een van beide cursussen
- cursussen jaar 2 (verplicht en keuze)

keuzecursussen jaar 1 (nader)

Vakken:

Naam	Periode	Credits	Code
Biomolecular Screening	Periode 4	3.0	X_432542
Biophotonics I: Microspectroscopy	Periode 3	3.0	AM_470629
Biophotonics III: Practical Training	Periode 3	3.0	AM_470630
Molecular Biology Techniques	Periode 3	3.0	X_432540
Molecular Pharmacology	Periode 4	3.0	X_432541
Molecular photobiology	Periode 4	3.0	X_432763
Protein Sciences Techniques	Periode 3	3.0	AM_470641

verplichte cursussen jaar 1

Vakken:

Naam	Periode	Credits	Code

Genomes and Gene Expression	Periode 1	6.0	AM_470614
Internship I Molecular Cell Biology	Ac. Jaar (september)	30.0	AM_471127
Protein Science	Periode 1	6.0	AM_470145
Scientific Writing in English	Ac. Jaar (september)	3.0	AM_471023

kies een van beide cursussen

Vakken:

Naam	Periode	Credits	Code
Cell Structures and Functions	Periode 2	6.0	AM_470615
Evolving Networks	Periode 2	6.0	AM_1020

cursussen jaar 2 (verplicht en keuze)

Vakken:

Naam	Periode	Credits	Code
Business and Innovation in Life Science	Periode 1, Periode 3	3.0	X_432539
Caput Microbial Genomics	Ac. Jaar (september)	3.0	AM_1021
Developmental Biology	Periode 2	6.0	AM_470613
Dynamics of Biomolecules and Cells	Periode 4	6.0	X_422583
Ethics in Life Sciences	Periode 3	3.0	AM_470707
Extreme Biology	Periode 2	6.0	AM_470509
Internship II Molecular Cell Biology	Ac. Jaar (september)	30.0	AM_471128
Structural Bioinformatics	Periode 4	6.0	X_405019
Thesis Based on Literature Study	Ac. Jaar (september)	9.0	AM_471153

Capita courses MSc Biomolecular Sciences

Vakken:

Naam	Periode	Credits	Code
Caput AIMMS Lectures and Seminars	Ac. Jaar (september)	3.0	X_432764
Caput Cellular Protein Trafficking	Ac. Jaar (september)	6.0	AM_470605

Caput Epigenetics	Ac. Jaar (september)	6.0	AM_470606
Caput Microbial Genomics	Ac. Jaar (september)	3.0	AM_1021
Caput Molecular Biotechnology	Ac. Jaar (september)	6.0	AM_470604
Caput Protein Structure as Molecular Basis of Disease	Ac. Jaar (september)	6.0	AM_470120
Caput Structural Biology	Ac. Jaar (september)	6.0	AM_470607

Biomolecular Screening

Vakcode	X_432542 (432542)
Periode	Periode 4
Credits	3.0
Voertaal	Engels
Faculteit	Faculteit der Exacte Wetenschappen
Coördinator	dr. J. Kool
Docent(en)	dr. J. Kool
Lesmethode(n)	Hoorcollege, Practicum
Niveau	400

Doel vak
To learn, understand and work with modern analytical chemistry in the life sciences to identify proteins. More specifically, you will learn ways to find biologically active proteins in mixtures, purify them and finally identify them using proteomics techniques.

Inhoud vak
During this course the potential of modern analytical and biological screening techniques used in bioactivity screening of bioactive proteins will be discussed. The emphasis will be on finding bioactive proteins in complex biological samples by LC-MS in combination with post-column bioassays. Protein identification strategies using bottom-up proteomics proteomics approaches will be focused on during this course. You will learn how to find biologically active proteins in complex mixtures and know how to identify these proteins by their (partial) amino acid sequence. Sample treatment and advanced sample preparation techniques will play an important part in this as well as LC-MS, bioassays and database searches with the proteomics data obtained. We will work with natural extracts such as snake venoms as our complex biological samples, which contain potential biopharmaceutical candidate proteins.

Onderwijsvorm
The course starts with a thorough explanation of the course and its contents. Then we will start with the practical work. In between the practical work, lectures will be all given that discuss in more detail and assist the practical work. Relevant literature will be provided via blackboard. All students will (besides their practical report) work on a literature assignment related to a topic in bioactivity profiling in a biopharmaceutical setting.

Toetsvorm
The mark given for the literature report will constitute 50% of the final mark. The mark of the practical report also constitutes 50% of the final mark. This mark is given for the insights shown, motivation and

other relevant issues such as presence during the course, practical course report, safety considerations and practical results obtained Both marks have to be at least 5.5.
Presence during the practical course days is obligatory.

Literatuur
Lectures and tutorials
Literature to study is mainly from e-books (chapters) and from academic papers/reviews. All literature needed can be found in the course documents on BlackBoard. Tutorials will be given by the course supervisors during the practical work.

Course reading
All PowerPoint lectures will be placed on BlackBoard at least one day before each lecture. All PDF e-book chapters and other literature (e.g. academic research papers and reviews) can already be found on BlackBoard.

Vereiste voorkennis
Basic knowledge of biochemistry, separation sciences and mass spectrometry.

Doelgroep
Master phase practical course

Overige informatie
A lab coat is required for the practical part.

Biophotonics I: Microspectroscopy

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

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

Vakcode	AM_470630 ()
Periode	Periode 3
Credits	3.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. ir. Y.J.M. Bollen
Niveau	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 (±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 and Innovation in Life Science

Vakcode	X_432539 (432539)
Periode	Periode 1, Periode 3
Credits	3.0
Voertaal	Engels
Faculteit	Faculteit der Exacte Wetenschappen
Coördinator	drs. P. van Hoorn
Docent(en)	prof. dr. I.J.P. de Esch, drs. P. van Hoorn
Lesmethode(n)	Hoorcollege
Niveau	400

Doel vak
This course positions the field of Biomolecular Sciences in a broader context by sketching out the Pharma-Biotech industrial landscape.

Inhoud vak
The Pharma-Biotech industrial landscape is presented in several ways;

1. business and value chain modeling common in these industries
2. product strategy and life-cycle dynamic in the Pharma and Biotech sector
3. innovation and the position of Genomics and Proteomics in the future of
Health and Life Sciences

In addition to lectures on the above 3 topics, students will be handed certain texts and articles that illustrate the `State of the Art' in the Pharma-Biotech industrial
sector from both a product development as well as from a business development standpoint.

As a result the student will get insight into the business decisions and dynamic that are linked to basic bioscientific research through product development. The course thus aims to provide a first general overview of how life science and business are interwoven in everyday industrial practice.

Two `real-life¿ cases will be discussed and students will get a group assignment in which the cases will have to be analyzed and certain questions will have to be answered. Each group writes a short analysis and subsequently presents this in front of the whole group.

As part of this course, a guest speaker from industry will be giving a lecture.

Onderwijsvorm
Lectures, guest lectures by industrial and Life Science venture capital firm representatives, final presentation. Two harvard case will be used including assignments.

Toetsvorm
In order to receive 3 credits for this course, the following criteria must be met:
- the written exam must be passed with a grade 6 or more (60% of final grade)
- case analysis and presentation in front of the entire class with a grade 6 or more (40%)
Written exam w 4 open questions.

Literatuur
Rydzewski - Real world Drug Discovery , A chemist's guide to Biotech and Pharmaceutical Research (selected chapters)- 2008
Additional literature provided on Blackboard.

Vereiste voorkennis
Bachelor Physics, Chemistry, Mathematics, Biology, Medical Biology Pharmaceutical Sciences, Medical Natural Science, Bachelor Science Business and Innovation.

Aanbevolen voorkennis
Completed Bachelor Physics, Chemistry, Mathematics, Biology, Medical Biology
Pharmaceutical Sciences, Medical Natural Science and Science Business and Innovation.

Doelgroep
M Bio molecular Sciences, Chem, DDS

Caput AIMMS Lectures and Seminars

Vakcode	X_432764 ()
Periode	Ac. Jaar (september)
Credits	3.0
Voertaal	Engels
Faculteit	Faculteit der Exacte Wetenschappen
Coördinator	dr. J.E. van Muijlwijk-Koezen
Niveau	400

Doel vak
To become familiar with different topics in the broad field of fundamental research in human life sciences

Inhoud vak
The Amsterdam Institute for Molecules, Medicines and Systems (AIMMS) organizes biweekly the so-called AIMMS-seminars. Next to this, (inter) national researchers are invited for AIMMS Lectures.

Onderwijsvorm
The student will visit 6 seminars or lectures, summarize, and reflect on each of them in a written report. The size of the report will be approximately 1 A4 per seminar/lecture.

Overige informatie
Please contact the coordinator in advance.

Caput Cellular Protein Trafficking

Vakcode	AM_470605 ()
Periode	Ac. Jaar (september)
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. J.P. van Ulsen
Niveau	500

Doel vak
The aim of this theoretical course for master students is to study a number of recent, short and state-of-the-art review papers in the area of protein secretion and cellular protein trafficking. The students will get insight into the principles and mechanisms by which prokaryotic and eukaryotic cells target and insert proteins into membranes and target them subcellular organelles and the extracellular environment. The course will highlite the similarities between different organisms and the common mechanisms with respect to protein secretion and trafficking. Furthermore the application of this knowledge and research in medical sciences and in biotechnology is addressed. The emphasis is on bacterial systems. End terms for the student:
- To know and understand the biochemical principles and molecular and cellular processes that play a role in protein targeting to biomembranes
- To know and understand the biochemical principles and the molecular and cellular processes that play a role in the insertion of membrane proteins into biomembranes
- To know and understand the biochemical principles and the molecular and cellular processes that play a role in the transport of proteins through biological membranes and into the extracellular environment.

Inhoud vak
Protein trafficking in E. coli:
Biogenesis of inner membrane proteins in E. coli.
Targeting and assembly of periplasmic and outer membrane proteins.

Protein translocation across membranes: secretion systems, their structure, biology, and function.
Protein traffiscking in eukaryotes:
Biogenesis of membrane proteins, intracellular protein trafficking, vesicle transport.

Onderwijsvorm
Introductory meeting with course coordinator (1h). Followed by self-study of the literature. An additional meeting for questions and discussion of the literature can be arranged upon request. Questions may also be asked via e-mail.

Toetsvorm
Written exam with assay questions

Literatuur
As a basis Chapters 12 and 13 of the book "Molecular Biology of the Cell",Alberts et al. Garland Science Ltd (5th edition; 2008) can be studied. The corresponding Chapters of earlier editions are also OK.

Additional reviews:
Walther DM, Rapaport D, Tommassen J. (2009) Biogenesis of beta-barrel membrane
proteins in bacteria and eukaryotes: evolutionary conservation and divergence.
Cell Mol Life Sci. 66:2789-2804
- Integration of proteins into the outer membrane of gram-negative bacteria and the outer membranes of organelles is facilitated by a conserved machinery.

Cross BC, Sinning I, Luirink J, High S. (2009) Delivering proteins for export from
the cytosol. Nat Rev Mol Cell Biol. 10:255-264
- The conserved Sec machinery in pro- and eukaryotes

Wang P, Dalbey RE. (2011) Inserting membrane proteins: the YidC/Oxa1/Alb3 machinery in bacteria, mitochondria, and chloroplasts. Biochim Biophys Acta. 1808:866-875
- Integration of proteins in the cytoplasmic membrane of bacteria and organelles

Karuppiah V, Berry JL, Derrick JP. (2010) Outer membrane translocons: structural
insights into channel formation. Trends Microbiol. 19:40-48
- Structural Biology of bacterial secretion systems

Ellis TN, Kuehn MJ. (2010) Virulence and immunomodulatory roles of bacterial outer membrane vesicles. Microbiol Mol Biol Rev. 74:81-94
- Vesicle transport in bacteria and their role in virulence

Schmidt K, Stephens DJ. (2010) Cargo loading at the ER. Mol Membr Biol. 27:398-411
- Vesicle transport and insertion of proteins in eukaryotes

This list may be subject to change if more up-to-date articles appear.

Doelgroep

Students of all Master's programmes within Health and Life Sciences

Caput Epigenetics

Vakcode	AM_470606 ()
Periode	Ac. Jaar (september)
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. J.M. Kooter
Niveau	500

Doel vak
Acquiring knowledge and insight of
- Chromatin structure and its dynamic nature
- Epigenetic mechanisms of transcriptional regulation and genome maintenance
- Somatic and transgenerational inheritance of epigenetic marks and consequences
- Processes in human, animals, plants, fungi, and/or bacteria involving epigenetic mechanisms (depends on student’s MSc)
- Human diseases, including cancer, due to defective epigenetics
- Importance of epigenetics in the 'Nature - Nurture' debate
- Experimental approaches and techniques to study epigenetics

Inhoud vak
• Non-Mendelian inheritance of traits
• Biochemistry of DNA methylation and de-methylation
• Biochemistry of histone modifications and chromatin structure
• Composition of chromatin and chromatin remodeling
• Somatic and gametic cell inheritance of epigenetic information
• Cellular memory by means of polycomb-group proteins
• Role of DM&CM in gene expression
• Transposon silencing
• Role of epigenetics in cancer and other diseases
• Role of DM&CM in sex-chromosome inactivation and activation
• Role of DM&CM in gene-dosage compensation
• Role of DM&CM in genomic / parental imprinting
• Epigenetic reprogramming events during mammalian development
• Stem cells, reprogramming and epigenetics
• Role of non-coding RNAs / RNA interference in DM&CS
• Epigenetic effects of diet, nutrition, drugs and environmental factors, including behaviour
• Neurobiology and epigenetics
• Transgenerational effects: inheritance of epigenetic-based traits
• Role of epigenetics in evolution
• Methods to analyze DM&CM

Onderwijsvorm
- Self-study of research and review articles (ca 140 hr)
- Group meetings (1-2 per week) discussing the research and review articles (ca 15 hr)
- Weblectures by experts (ca 10 hr)

Toetsvorm

Written exam

Literatuur
- Review and Research articles accesible via Blackboard.
- Molecular Biology of the Cell by Alberts et al., fifth edition:
Chapters on DM&CM and transcriptional control of gene expression

Vereiste voorkennis
Bachelor level Genetics and Molecular Biology

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

Caput Microbial Genomics

Vakcode	AM_1021 ()
Periode	Ac. Jaar (september)
Credits	3.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	prof. dr. R. Kort
Niveau	500

Doel vak
1. After the lecture series the students obtained insight in:

- The historical development of microbiological sciences
- Techniques to explore the human microbiome
- Human – Microbe interactions
- Metabolic strategies of microorganisms
- Utilization of microorganisms for synthesis of small organic compounds
- Molecular basis for cell division and targets for antibiotics
- Microbial adaptations to extreme conditions
- Microbes linked to production and spoilage of food

2. Students have gained experience on thinking and writing about the impact of microbes on either our environment, or human health, or industrial applications.

Inhoud vak
This lecture series will leave a strong impression of an invisible kingdom of life forms: the microorganisms. During 14 lectures, the enormous diversity of microbial life will become evident. The lectures will include a number of ways to explore microbial life forms associated with our body, the environment and food. In addition, a number of methods will be addressed to exploit microorganisms to the benefit of humankind.

Onderwijsvorm
14 lectures (obligatory) including a 4-5 p. perspective

Toetsvorm
Each student will write a perspective (approximately 4-5 pages) for of one of the 12 lectures; the abstract will containing a 1 page summary

of the lecture, and 3 pages on the relevance of the microbiological topic for society (i.e. about applied microbiology for the benefit of society, including environment, human health, industrial benefits, etc.). The selected lecture will be announced after the final lecture (October 31).

Literatuur

Roeselers G, Bouwman J, Venema K, Montijn R. The human gastrointestinal microbiota--an unexplored frontier for pharmaceutical discovery. Pharmacol Res.
(2012) 66:443-7.

Wijffels RH, Kruse O, Hellingwerf KJ. Potential of industrial biotechnology
with cyanobacteria and eukaryotic microalgae. Curr Opin Biotechnol.
(2013) 24:405-13.

Crielaard W, Zaura E, Schuller AA, Huse SM, Montijn RC, Keijser BJ. Exploring
the oral microbiota of children at various developmental stages of their dentition in the relation to their oral health. BMC Med Genomics. (2011) 4;4:22.

Khandelwal RA, Olivier BG, Röling WF, Teusink B, Bruggeman FJ. Community flux
balance analysis for microbial consortia at balanced growth. PLoS One (2013)
31;8(5):e64567.

Teusink B, Westerhoff HV, Bruggeman FJ. Comparative systems biology: from
bacteria to man. Wiley Interdiscip Rev Syst Biol Med. 2010 Sep-Oct;2 (5):518-32. Review.

Bolhuis H, Poele EM, Rodriguez-Valera F. Isolation and cultivation of Walsby's
square archaeon. Environ Microbiol. (2004) 6:1287-91.

de Vos WM, Kengen SW, Voorhorst WG, van der Oost J. Sugar utilization and its
control in hyperthermophiles. Extremophiles. (1998) 2:201-5. Review

Smid EJ, Lacroix C. Microbe-microbe interactions in mixed culture food fermentations. Curr Opin Biotechnol. (2013) 24:148-54.

Vereiste voorkennis

Molecular Biology

Aanbevolen voorkennis

General and Molecular Microbiology

Doelgroep

MSc Students BioMolecular Sciences

Overige informatie

Venue:

Natura Artis Magistra, Plantage Kerklaan 38-40, Amsterdam
@ De Volharding

http://www.artis.nl/ontdek-artis/artis-a-z/monumenten-z/de-volharding/

TOPICS AND SPEAKERS [first lecture: 10:00 – 10:50 u; second lecture: 11:10 – 12:00 u]

I General introduction (12 september)
1. Microbiology - a historical perspective. Prof. Remco Kort TNO, VUA. http://nl.linkedin.com/pub/remco-kort/14/547/403
2. Introduction into the human microbiota. Prof. Remco Kort TNO, VUA. http://nl.linkedin.com/pub/remco-kort/14/547/403

II The human microbiota (19 september)
3. Microbial ecology of the gastro-intestinal tract. Dr. Guus Roeselers, TNO. http://nl.linkedin.com/in/roeselers
4. Mouthful of microbes. Dr. Bart Keijser, TNO. http://nl.linkedin.com/pub/bart-keijser/12/931/841

III Microbial Cell Physiology I (26 september)
5. Coping with smallness: exploiting microbial survival strategies for biotechnology. Prof. Joost Teixeira de Mattos, UvA. http://nl.linkedin.com/pub/joost-teixeira-de-mattos/48/a37/461.
6. Purpose in life: metabolic strategies of microbes. Prof. Bas Teusink, VUA. http://nl.linkedin.com/pub/bas-teusink/14/220/98a.
IV Synthetic biology (3 oktober)
7. Engineering microbial cell factories for the production of chemical commodities and liquid fuel. Prof. Klaas Hellingwerf, UvA. http://www.linkedin.com/pub/klaas-jan-hellingwerf/12/a48/aa5

8. Stealthy engineering versus perfect adaptation in a robust chassis: learning from biological design. Prof. Hans Westerhoff, VU, UvA, University of Manchester. http://www.falw.vu/~microb/mcf/personnel/htm/westerhoff.html
V Microbial Cell Physiology II (10 oktober)
9. Spontaneous variation in microbial cell populations. Prof. Frank Bruggeman, VUA
http://nl.linkedin.com/pub/frank-bruggeman/6/516/a18
10. Bacterial cell division. Dr. Leendert Hamoen, UvA.
http://uk.linkedin.com/pub/leendert-hamoen/5/335/828
VI Microbial Life under extreme conditions (17 oktober)
11. Some like it hot. Prof. John van der Oost, WUR
http://www.wageningenur.nl/en/Persons/prof.dr.-J-John-van-der-Oost.htm

12. Haloquadratum walsbyi, a tale of life at extreme salinities. Dr. Henk Bolhuis, NIOZ
http://nl.linkedin.com/pub/henk-bolhuis/1a/692/419

VII Food Microbiology (31 oktober)
13. The best food products are made by microbes. Dr. Eddy Smid, WUR.
http://nl.linkedin.com/pub/eddy-j-smid/9/338/9a8
14. Food and crop spoilage. Dr. Jan Dijksterhuis, RUU.
http://nl.linkedin.com/pub/jan-dijksterhuis/3/846/631

Caput Molecular Biotechnology

Vakcode	AM_470604 ()
Periode	Ac. Jaar (september)

Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. S. Luirink
Niveau	500

Doel vak
The aim of this theoretical course is to get insight in the principles, methods, and applications of recombinant DNA technology with respect to the broad field of medical and industrial biotechnology. To this end the students study a book.
Final attainment levels: To know and to understand the fundamental principles of modern molecular biotechnology as well as the most recent developments in that area of science. To know and to understand the newest molecular techniques and biotechnological applications of microbial and viral systems. To know and to understand the most recent biotech developments, techniques and applications in eukaryotic systems including plants, animals and humans.

Inhoud vak
The development of molecular biotechnology; DNA, RNA, and protein synthesis; Recombinant DNA technology; Chemical synthesis, sequencing, and amplification of DNA; Bioinformatics, genomics and proteomics; Manipulation of gene expression in prokaryotes; Recombinant protein production in eukaryotic cells; Directed mutagenesis and protein engineering; Molecular diagnostics; Microbial production of therapeutic agents; Vaccines; Synthesis of commercial products by recombinant microorganisms; Bioremediation and biomass utilization; Plant-growth-promoting bacteria; Microbial insecticides; Large-scale production of proteins from recombinant microorganisms; Genetic engineering of plants: methodology; Genetic engineering of plants: applications; Transgenic animals; Regulating the use of biotechnology; Societal issues in biotechnology

Onderwijsvorm
Initial contact with the lecturer, introduction into the book and self study. Possibly additional contact with the lecturer.

Toetsvorm
A written exam with essay questions.

Literatuur
Molecular Biotechnology; principles and applications of recombinant DNA; Bernhard R. Glick and Jack J. Pasternak. ASM Press, Washington D.C. last version (4th). VU book store or library.

Vereiste voorkennis
A bachelor degree in biology, medical biology, biomedical sciences or biochemistry. Basic (bachelor) knowledge of cell biology, microbiology, molecular biology and molecular genetics is required.

Doelgroep
Masterstudents Biomolecular Sciences

Overige informatie
E-mail: s.luirink@vu.nl

Caput Protein Structure as Molecular Basis of Disease

Vakcode	AM_470120 ()
Periode	Ac. Jaar (september)
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. D. Bald
Niveau	500

Doel vak
Overview of recent advances in research of molecular disease based on protein structure;

Final attainment level:

The student has insight into the relation between protein structure/ (mal-) function;
The student has insight into the relation protein (mal)-function/disease.
the student can screen, evaluate scientific literature and present a structured review recent advances

Inhoud vak
Suggested topics are:
• Antibiotic action
• Antibiotic Resistance
• Cancer/p53
• Anti-Influenza drugs
• Tuberculosis drug targets
• Anti-aids drugs
Feel free to suggest other topics related to protein structure/function, please ask the docent for more information.

Onderwijsvorm
You receive several original publications on a recent topic in protein structure/disease (see above) from the docent. You study these papers and collect more information (data-base search etc.) about research in the field. Finally you can either write up your results in a review-style paper or give an oral presentation.

Toetsvorm
Oral or written presentation (choice)

Literatuur
Literature depends on the topic chosen by the student. Literature search in self-study.

Doelgroep
Masters students Biomolecular Sciences, Biomedical Sciences, Biology, Pharmaceutical Sciences, Medical Natural Sciences

Caput Structural Biology

Vakcode	AM_470607 ()
Periode	Ac. Jaar (september)
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. ir. Y.J.M. Bollen

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

Inhoud vak
One of the following topics:
- Adaptation of microorganisms to extreme environments
- Prion proteins
- Fluorescent proteins

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

Toetsvorm
Oral discussion with the lecturer

Literatuur
A number of recent scientific papers will be provided

Vereiste voorkennis
See entry requirements for the specified MSc programs.

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

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

Cell Structures and Functions

Vakcode	AM_470615 ()
Periode	Periode 2
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. S. Luirink
Docent(en)	dr. S. Luirink
Lesmethode(n)	Hoorcollege
Niveau	400

Doel vak
The first aim of the course is to refresh and deepen the knowledge of the students in a number a selected topics of Molecular Cell Biology.

These topics include the folding, modification and sorting of proteins in cells. How do proteins fold in their correct and active three-dimensional structure? How do proteins reach their correct destination in the cell (organelles, plasma membrane)? How do proteins insert and assemble in membranes, how are they translocated across membranes? How are these processes related to disease and drug development? The students will gain insight in the most recent research data and theories. Also, the students will get information on state-of-the-art methods and techniques used in this field such as fractionation of cells, determination of protein structure, proteomics, molecular interaction/crosslinking techniques and visualization of cells and cell components.
Of note, the objective is not to obtain a comprehensive overview of cell biology. After the general "refreshment" and technical part (first week), a few selected topics will be discussed in depth with guest lecturers based on primary research papers (second and third week). Related to this, the second aim of the course is to learn how to read, appreciate and discuss reviews and primary research papers on various topics.
Final attainment levels: General knowledge of general indicated topics relevant for the course at the level of the "big" "Molecular Biology of the Cell" (Alberts et al.); In depth knowledge on the selected topics provided by guest lecturers. This includes the ability to interpret newly acquired primary literature.

Onderwijsvorm
In the first part of the course (one week) students will study and discuss in working groups part III (methods) and part IV (internal organization of the cell) of the book: "Molecular Biology of the Cell" (Alberts et al.). Chapter by chapter the students will be guided through the book and questions will be answered. Excursions will be organized to labs specialized in specific techniques (10 contact hours)
In the second part of the course (about two weeks; 20 contact hours) specific topics (protein trafficking, protein insertion into membranes, membrane protein function, glycosylation and quality control) will be studied and discussed with lecturers from the VU and other universities. Each lecturer will present a seminar and discuss with the students very recent research papers and developments in the particular area of interest. The reviews and papers will be available via blackboard before the lectures.
The third part (last week) of the course will be used to study and to prepare for the exam. The exam will be in "open book" format. There will be 6 questions about the papers presented by the lecturers (presented in week 2 and 3) and 2 questions about the relevant topics in Alberts and cell biology techniques (presented in week 1).

Toetsvorm
A written exam with essay questions in which the Alberts book and print-outs of papers discussed by the lecturers can be used (open book exam) as well as a calculator.

Literatuur
Molecular Biology of the Cell (Alberts, Johnson, Lewis, Raff, Roberts, Walter) Fifth edition, Garland Sciences.
Research papers presented by the lecturers: links available via blackboard 1 month prior to the course

Vereiste voorkennis

A bachelor degree in biology, medical biology, biomedical sciences or biochemistry. Basic (bachelor) knowledge of cell biology, microbiology, molecular biology and molecular genetics is required.

Doelgroep
Master students Biomolecular Sciences

Overige informatie
Maximum number of participants: 50
E-mail: s.luirink@vu.nl
Guest lecturers (subject to reservation) Prof. I. Braakman and Dr. P. Peters (UU), Prof. P. Peters and Prof. T. Sixma (NKI); Prof. C. De Koster and Dr. B. Distel (UvA); Dr. M. Wilhelmus (VUMC)

Chemical Biology

Vakcode	X_432538 (432538)
Periode	Periode 1
Credits	6.0
Voertaal	Engels
Faculteit	Faculteit der Exacte Wetenschappen
Coördinator	prof. dr. R. Leurs
Docent(en)	prof. dr. R. Leurs
Lesmethode(n)	Hoorcollege, Computerpracticum
Niveau	400

Doel vak
To get students acquainted with modern chemical biology techniques to modulate DNA, RNA and protein function.

Inhoud vak
In this course emphasis will be given on the interface between Chemistry and Biology. How can one understand biological processes by using small molecules? How can one identify small molecules targeting new biochemical pathways, either by using modern biochemical or cellular assays (e.g. SPR, FRET, BRET, High-content & High resolution analysis), or in silico using the wealth of new information from structural biology. How to detect and modulate DNA, RNA and protein function with chemical probes. Moreover, detection of proteins and their interactions with other molecules will be discussed in detail.

Onderwijsvorm
Lectures, tutorials, and computer practicals.

Toetsvorm
Assignments (100%)

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

Vereiste voorkennis
Bachelor Pharmaceutical Sciences, Medical Natural Science, Science, Business and Innovation or Chemistry, Portal course MSc Biomolecular

Science, Signal Transduction in Health and Disease, or equivalent

Doelgroep
mBMS-BC, mCh-SBI, mDDS-BCCA, mDDS-CMCT, mDDS-DD&S, mDDS-DDSA, mDDS-DDTF, mDDS-C-var, mDDS-E-var, mDDS-M-var, mPhys-SBI

Computational Design and Synthesis of Drugs

Vakcode	X_435673 (435673)
Credits	6.0
Voertaal	Engels
Faculteit	Faculteit der Exacte Wetenschappen
Coördinator	dr. D.P. Geerke
Docent(en)	prof. dr. I.J.P. de Esch
Lesmethode(n)	Hoorcollege
Niveau	400

Doel vak
To gain insight and experience in the molecular modeling tools that enable (rational) drug design and to examine and plan efficient routes to synthesize conceived ligands.

Inhoud vak
In the post-genome era, an overwhelming amount of data describing the molecular characteristics of the targets is becoming available. For example, the structure of many proteins is being determined using X-ray analysis and NMR techniques. Furthermore, high-throughput screening results in massive amounts of data that reveal the molecular properties of the ligands that are able to have interaction with the drug targets. In this course, several techniques that can help to translate this data into novel ligands will be discussed and demonstrated. Specific topics include crystal structure analysis, molecular docking, homology modeling, calculating binding free energy and affinity of ligands for the protein, de novo structure generation, and pharmacophore modeling. These techniques generate ideas for novel compounds. Because a design that cannot be synthesized is by definition a useless design, the synthetic feasibility is a key and integral part of the design process. Therefore, it is important to be able to define a synthetic pathway for the preparation of the designs. In this course, this aspect will be covered by lectures on the concept of retrosynthesis and on the incorporation of some biologically relevant functional groups, such as bioisosteres and known affinity-increasers. An online retrosynthetic demonstration with a search engine sets the stage for a case study. For a specific design, a versatile and robust synthesis route has to be defined. A thorough literature search, in combination with detailed study of the reactions involved will result in a report that describes the suggested chemistry in detail.

Onderwijsvorm
Project basis: including lectures, tutorials, self study, assignments and group-work on a case-study.

Toetsvorm
Written examination, preparation of a report.

Aanbevolen voorkennis
Knowledge of basic organic chemistry.

Doelgroep
mDDS

Overige informatie
Please contact the coordinator four weeks prior to the start of the course (e-mail: ideesch@few.vu.nl).

Developmental Biology

Vakcode	AM_470613 ()
Periode	Periode 2
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	prof. dr. R.E. Koes
Docent(en)	dr. R.F.G. Toonen, dr. ing. E.J. Souer, prof. dr. R.E. Koes
Lesmethode(n)	Hoorcollege
Niveau	600

Doel vak
The development of a single cell, the fertilized egg cell, into a complex organism with all its tissue and organs in the right place is one of the most intriguing phenomena in biology. Whereas disciplines like molecular and cell biology aim to unravel the molecular mechanisms of a single cell, developmental biology aims to understand how such mechanisms make cells work together in a coherent way to form an entire organism. The overall aim of this course is to provide insight into these molecular mechanisms, such as the regulation of the expression of master genes and cell-to-cell signaling pathways underlying plant and animal development.

Final attainment levels:
- the student has a basic understanding of morphological events that take place during embryogenesis in animals
- the student can describe and distinguish key-concepts in development, such as (i) pattern formation (ii) determination of cell fate, (ii) differentiation and link that to general phenomena known in molecular biology, such as gene regulation, epigenetic phenomena, cell-signalling etc.
- The student can describe the similarities in the development of animals as different as fruitflies and vertebrates, in terms of morphological events and underlying molecular mechanisms.
- The student can explain the paradox that development of organisms with very different morphologies is governed by deeply conserved genes, and understands the molecular evidence for the current ideas.
- The student acquires experience in the critical analysis and discussion of experimental data as presented in research papers and the presentation of such data for a large(r) audience.

Inhoud vak

The first two weeks will be shared with the MSc course Developmental Neurobiology of the vertebrate brain. The first week consists of lectures on general developmental biology For the second week one of two paths can be chosen: (1) Development of the brain or (2) Plant development. The first part of the course finishes with a written "mid term exam"
In the third and the fourth week the focus shift to specific "hot topics" and research. Three or four masterclasses will be given by invited speakers/researchers that will give an overview of their own research field and discuss their experimental results.
Furthermore, students (couples) will choose 2-3 recent research papers on a hot topic of their interest that they will study in depth to prepare for a small masterclass at the end of week 4 in which they outline the current status of the chosen subject , and present (and critically evaluate) the latest experimental data. Students can freely choose papers on plant or animal development. This ensures that everyone can follow his/her own preference for animal or plant biology and that, in the end, everyone gets a broad view on what is is currently going on in (plant or animal) developmental biology.

Specific issues that we will address in the first two weeks are:
- General key-concepts in development, such as pattern formation, segmentation, determination of cell fate, with emphasis on the experimental evidence on which our current knowledge is based
- Research strategies that are widely used in developmental biology.
- Molecular mechanisms that govern the development of embryos in insects (Drosophila) and vertebrates
- Elementary aspects of stem cell biology and "reprogramming" of differentiated cells into stems cells
- Evolutionary aspects: how can it be that deeply conserved genes govern the development of organisms with entirely different bodyplans, like fruitflies and vertebrates, or weed plants and trees.
- Late events in embryogenesis, the formation of organs (organogenesis). This will be entirely focused on development of the brain (for students taking the path Brain development)
- Early (embryogenesis) and late events (development of flowers and leaves) in the development of plants. What are similarities and differences with the development of animals?

In the last two weeks we will focus in depth on research concerning particular "topics that are currently "hot" in developmental biology.
Subjects that will be covered by invited speakers are:
- Development and functioning of stem cells and stem cell niches in the intestine.
- Role of Hox genes in the segmentation and later development of vertebrates
- Molecular mechanisms that govern pattern formation in plants
Subjects that wiil be covered in the masterclasses given by student depends on the choices that are made during the course and are, therefore, not entirely predictable beforehand. Some of the subjects that will almost certainly be covered are:
- Reprogramming of differentiated cells into stems cells and dangers/possibilities for use of such cells in therapy
- Intercellular movement of proteins like transcription factors, which were hitherto always believed to act only in the cells where they are synthsised

Onderwijsvorm
Lectures and masterclasses (~ 58 hrs).
Self study (~ 55 hrs)

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

Literatuur
There is no specific handbook. You might find it useful to consult, on occasion, a handbook (any) to refresh your memory on some basic cellular processes, like gene regulation, signaling and so on, if that is necessary.
Handouts, incl. PowerPoint files of lectures, pdf files of relevant review and research papers will be provided via the Blackboard site.

Vereiste voorkennis
Basic knowledge (level 1/2) of molecular biology in particular mechanisms underlying regulation of gene expression, cell-signalling.
General affection for molecular biology is recommended

Doelgroep
Master students: Biomolecular Sciences, Biology, Biomedical Sciences

Drug-induced Stress and Cellular Responses

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

Vakcode	X_422583 ()
Periode	Periode 4
Credits	6.0
Voertaal	Engels
Faculteit	Faculteit der Exacte Wetenschappen
Coördinator	dr. J.T.M. Kennis
Examinator	dr. J.T.M. Kennis
Docent(en)	dr. J.T.M. Kennis
Lesmethode(n)	Hoorcollege
Niveau	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
Hoorcolleges, literatuur essay, mondelinge presentatie literatuur

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

Ethics in Life Sciences

Vakcode	AM_470707 ()
Periode	Periode 3
Credits	3.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	prof. dr. J.T. de Cock Buning
Docent(en)	prof. dr. J.T. de Cock Buning, dr. J.F.H. Kupper
Lesmethode(n)	Hoorcollege, Werkgroep
Niveau	400

Doel vak
To provide a toolbox of ethical instruments to analyze properly moral problems related (to one's own) research in the life sciences
• To acquire conceptual knowledge of the central concepts in applied philosophy and professional ethics
• To challenge an ethical reflection on one owns life science specialization and to open it for an impartial and constructive discussion
• To exercise a team based project to enter prepare and execute a moral dialogue
• To acquire the necessary skills to handle ethical issues in an accountable manner, as a professional academic beyond one's own inclinations and prejudgments

Inhoud vak
Researchers in life sciences generate the knowledge that builds the future of our society. Therefore, professional academics should be accountable for their decisions, experimental designs and presentation of results. In this short course, the principles of justification will

be illustrated with cases of technology ethics and medical ethics. The way an ethical review committee on animal research works, is simulated by a role play exercise on an actual research protocol. Finally, as a small group training project, an ethical dialogue is prepared and executed together with another team.

Onderwijsvorm
Ethics in the Life Sciences is a fulltime course of four weeks (3 ECTS). The total study time is 80 hours.
The different elements have the following study time:
• Lectures: 13 hours
• Work groups: 17 hours
• Group assignment: 24 hours
• Exam: 2 hour
• Presentation : 4 hours
• Self working (reading in the first week): 20 hours
Please note that attendance to the work group meetings is compulsory. Attendance to the lectures is highly recommended. In our experience, relying on self-study alone is insufficient to apply the theory of the lectures in the assignments of the workgroups, and to pass the exam.

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

Literatuur
Available on Blackboard

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

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

Overige informatie
Lectures in English, part of the workgroups are in Dutch. All presentations and plenary discussions in English. Attendance is compulsory.

Evolving Networks

Vakcode	AM_1020 ()
Periode	Periode 2
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. D. Molenaar
Docent(en)	prof. dr. H.V. Westerhoff, prof. dr. B. Teusink, dr. D. Molenaar, prof. dr. F.J. Bruggeman
Lesmethode(n)	Hoorcollege, Werkgroep, Computerpracticum
Niveau	400

Doel vak
Biological systems consist of complex networks of interacting metabolites, molecules, cells, organisms and populations. We often assume that these networks are highly tuned to perform specific functions. But is that assumption justified? Can we investigate whether a signal transduction network is moulded by natural selection to perform a specific function optimally? Evolutionary experiments with microorganisms and detailed analysis of infection diseases have shown that they are extremely flexible, and can change functions very quickly by mutation or by incorporating large quantities of foreign DNA. In a similar manner, cancer cells carry many mutations, and are selected to perform functions that promote uncontrolled growth in a body.

In this course we will investigate the relationship between interactions in molecular, metabolic and cellular networks, and the presumed function of these networks. On the one hand we will discuss the exciting recent studies that yield detailed views on the mechanisms of mutation and selection in microbial and cancer cell populations and on the other hand we will discuss why particular forms of networks are selected, by trying to understand the relation between network properties, functions, and ultimately fitness.

Inhoud vak
• Microevolution in medical, industrial and laboratory setting
• Fitness landscapes and selection in populations
• Predicting optimal network structures by using models, and testing these predictions
• Cancer development from a micro-evolutionary and systems perspective
• Structure and function of signalling networks

Onderwijsvorm
Lectures, computer practicals, and assignments.

Toetsvorm
Assessment will take place by practical assignments (20%) and a written exam (80%).

Literatuur
A reader will be provided.

Doelgroep
Master students with a background in Biology, Biomedical Sciences or Bioinformatics, with an interest in systems biology.

Extreme Biology

Vakcode	AM_470509 ()
Periode	Periode 2
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. ir. A.H. de Boer
Docent(en)	dr. ir. A.H. de Boer, dr. D. Bald, dr. W.F.M. Roling

Lesmethode(n)	Hoorcollege
Niveau	500

Doel vak
At the end of this course, the student will be able to describe and explain various aspects of adaptation to extreme environments:
• how cellular structures (e.g. membranes) and individual molecules (proteins/DNA) are affected by physical parameters like temperature, pH, salt, pressure and radiation
• how nature has solved these problems: what are the general and condition-specific adaptations to extreme conditions,
• what are the limits for life, and its relevance to the development of life on Earth and other planets,
• how can we exploit natures extreme adaptations?
• how to write a research proposal on an extremophile topic of choice

Inhoud vak
Biology of extreme life forms, or living under extreme environmental conditions, (in short extreme biology) has attracted more and more attention in recent years. Reasons for this increased interest are diverse: scientific curiosity (what solutions has nature come up with), understanding evolution of life on earth, and the potential for life on other planets, medical interest (cryobiology, sensor technology, enzyme technology), societal commitment (pollution, climate change) and industrial applications (novel enzymes with new applications). The key question is how extremophiles have adapted their enzymes/membranes/DNA structures etc. that serve the same function, but operate under very different physical constraints. The course will focus on life forms (mainly microorganisms and plants and some examples from animal life) that have developed in environments that we do not experience as ‘normal’. ‘Normal’ relates to environmental factors like temperature, water, oxygen, pressure, radiation, pH, salinity etc. Environments that are extreme with respect to these factors are e.g. hot springs, ice, deep sea, deserts, acidic/alkaline or saline waters or sites polluted by industry. At the end of the course the students must be able to:
• Identify and describe extreme environments.
• Describe the most important physical parameters that form a limitation for biological processes.
• Understand why and how physical parameters affect specific biological processes.
• Describe strategies developed by extremophiles to protect membranes, protein structures and DNA.
• Give examples of possible applications of extreme biology in science, industry, medicine, agriculture etc.
• Use the knowledge to write a research proposal on a subject of choice.

Onderwijsvorm
The course consists of lectures, workshops and presentations. Selected chapters of one book will be used. In addition, lecturers will discuss recent reviews and research papers with the students. Learning how to write your own research proposal will be an important part of the course. Each student will choose an extremophile topic of his/her choice and submit/defend a research proposal at the end of the course.

Toetsvorm

Written exam with essay questions (40%), Journal Club presentations and Research Proposal (60%). Grades for both parts must be 5.5 or higher.

Literatuur
Selected review and research articles.

Vereiste voorkennis
Bsc Biology, Biomedical Sciences

Doelgroep
Master students Biomolecular Science, Biology, Ecology and Biomedical Sciences with an interest in the extra-ordinary forms of life.

Genomes and Gene Expression

Vakcode	AM_470614 ()
Periode	Periode 1
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. J.M. Kooter
Docent(en)	dr. J.M. Kooter
Lesmethode(n)	Hoorcollege, Werkgroep, Overig, Deeltoets extra zaalcapaciteit
Niveau	400

Doel vak
To provide students with the basic features and latest insights and concepts of the various ways gene expression in eukaryotes is regulated. At the end of the course, students have acquired the knowledge and understanding of the topics listen under Course content.

Inhoud vak
The following topics will be covered:
Genome structure, Transcriptional regulation and Epigenetic mechanisms:
• Genome organization: coding versus non-coding sequences
• Composition and biochemistry of basic transcription machinery
• Transcription initiation, elongation and termination
• Regulatory sequences: promoters, enhancers, suppressors, boundaries
• Application of comparative genomics to identify cis-acting elements
• Epigenetics: Chromatin structure and histone modifications
• Epigenetics: DNA methylation
• Monoallelic gene expression
• Nuclear structure and long range DNA interactions
• Transcription regulation throughout the cell cycle
• Transcription regulation and development
• Regulatory networks: the regulation of regulators
• Cellular memory: establishing and maintaining differentiation status
• Gene expression control in stem cells and differentiation
• Non-coding RNAs and control of gene expression
• Intergenic and antisense transcription
• Techniques and applications

Post-transcriptional regulation
• RNA processing, including alternative splicing and its regulation

• Nucleo-cytoplasmic RNA transport
• RNA stability and degradation pathways
• RNA interference (siRNAs)
• Translation regulation and RNA degradation by micro(mi)RNAs
• RNA-editing
• Riboswitches
• Techniques and applications

Analysis of gene expression
• Human transcriptome
• Single-gene analyses and techniques
• Deep sequencing and micro-arrays

Onderwijsvorm
- Lectures, including lectures by guest speakers who are working in a particular field of research discussed in the course (ca 45 hr).
- Weblectures by experts (ca 6 hr)
- Self study (ca 110 hr)
We aim for a highly interactive atmosphere.

Toetsvorm
Two 'written' exams with open and closed questions (multiple choice (MC)): one at the end of week 2 (only MC), which contributes 40% of end grade, and the second at the end of week 4 (MC and open questions), which contributes 60%.

Literatuur
• Book: Molecular Biology of the Cell by Alberts et al., 5th edition: Chapters on chromatin structure, transcriptional and post-transcriptional regulation of gene expression (Chapters 4, 6, 7, 8)
• Book: Molecular Biology by Robert Weaver, 5th edition: Part I, II, IV, V, VIII)
• Research and Review articles on specific topics, illustrating the latest developments in the field (from Blackboard site)
• PPT - lecture notes

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

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

History of Life Sciences

Vakcode	AM_471017 ()
Periode	Ac. Jaar (september), Periode 3
Credits	3.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	prof. dr. I.H. Stamhuis
Docent(en)	prof. dr. I.H. Stamhuis, prof. dr. F.H. van Lunteren
Lesmethode(n)	Hoorcollege, Werkgroep, Werkcollege

Doel vak
We will address several of the more conspicuous changes in the life sciences during the last two centuries, such as the emergence of modern genetics, the social basis of Darwin's theory of evolution, the ''molecularization' of the life sciences, and the rise and fall of the eugenic movement. Three additional themes running through the course are the nature of scientific discovery, the disciplinary organization of science and the interaction between science and society.

Inhoud vak
We will address several of the more conspicuous changes in the life sciences during the last two centuries, such as the emergence of modern genetics, the social basis of Darwin's theory of evolution, the 'molecularization' of the life sciences, the rise and fall of the eugenic movement and the complex relationship between ecology and environmentalism. Three additional themes running through the course are the nature of scientific discovery, the disciplinary organization of science and the interaction between science and society.

Onderwijsvorm
Plenary lectures. Group assignments involving presentations. Course information, course lectures and readings, assignments and instructions will be posted on Blackboard.

Toetsvorm
The final grade is the weighted average of the grades of the group presentation (40%) and the individual written exam (60%) with the condition that to pass the exam, the final grade must be at least 6 AND the grades of both parts must be at least 5.

Literatuur
Articles

Overige informatie
N.B. 2012 - 2013 is the last possibility to follow History of Life Sciences.

Internship I Biological Chemistry

Vakcode	AM_471129 ()
Periode	Ac. Jaar (september)
Credits	30.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. H.S. van Walraven
Niveau	600

Internship I Molecular Cell Biology

Vakcode	AM_471127 ()
Periode	Ac. Jaar (september)
Credits	30.0

Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. H.S. van Walraven
Niveau	600

Internship II Biological Chemistry

Vakcode	AM_471130 ()
Periode	Ac. Jaar (september)
Credits	30.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. H.S. van Walraven
Niveau	600

Internship II Molecular Cell Biology

Vakcode	AM_471128 ()
Periode	Ac. Jaar (september)
Credits	30.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. H.S. van Walraven

Molecular Biology Techniques

Vakcode	X_432540 (432540)
Periode	Periode 3
Credits	3.0
Voertaal	Engels
Faculteit	Faculteit der Exacte Wetenschappen
Coördinator	J.C. Vos
Docent(en)	J.C. Vos
Lesmethode(n)	Hoorcollege, Practicum
Niveau	400

Doel vak
To introduce students into the application of basic techniques,
primarily DNA cloning and PCR, to express (mutant) genes.

Inhoud vak
Theoretical background on DNA cloning and gene expression.
Laboratory practical work involving, e.g.:
(1) generation and expression of mutant/human cytochrome P450 in E.
coli,
(2) cloning and testing of novel gene reporters for stress-response in
S. cerevisiae,

(3) cloning of fusion genes for cell biological purposes in S. cerevisiae, or
(4) cloning for aiming at overexpression of particular genes in S. cerevisiae.

Onderwijsvorm
Laboratory work, lectures, tutorials.

Toetsvorm
Laboratory work, assignments, written report.

Literatuur
Manual and protocols available on Blackboard.

Vereiste voorkennis
The course "Genomes and Gene Expression"

Doelgroep
mBMS

Overige informatie
Maximum number of students is 24.

Molecular Pharmacology

Vakcode	X_432541 (432541)
Periode	Periode 4
Credits	3.0
Voertaal	Engels
Faculteit	Faculteit der Exacte Wetenschappen
Coördinator	dr. M.H. Siderius
Docent(en)	dr. M.H. Siderius, dr. H.F. Vischer
Lesmethode(n)	Hoorcollege, Practicum
Niveau	400

Doel vak
To introduce students into the application of basic cell based pharmacology techniques, mammalian cell transfection, expression in cell lines, receptor-ligand binding assays, receptor-receptor interaction
assays (FRET/BRET), functional assays (reportergene assays, signaling assays).

Inhoud vak
Theoretical background on molecular pharmacology techniques. Laboratory practical work involving e.g. (1) Expression of wt and mutant GPCRs in mammalian cell lines (2) Analysis of expression and ligand binding (3) Functional analysis of GPCRs in model cell systems (4) Analysis of receptor-receptor interactions.

Onderwijsvorm
Laboratory work Lectures Tutorials

Toetsvorm

Active participation in the practical (50%), written reports (50%)

Literatuur
Manual and protocols available on blackboard

Vereiste voorkennis
Participation in BMS Portal courses is required.

Doelgroep
Master students Bio-molecular Sciences

Overige informatie
02-201x (first two weeks Feb.) Maximal number of students is 24.

A lab coat is required for the practical.

Molecular photobiology

Vakcode	X_432763 ()
Periode	Periode 4
Credits	3.0
Voertaal	Engels
Faculteit	Faculteit der Exacte Wetenschappen
Coördinator	prof. dr. R. Croce
Docent(en)	prof. dr. R. Croce
Lesmethode(n)	Hoorcollege
Niveau	400

Doel vak
To introduce students to multidisciplinary research in molecular photobiology, integrating a set of different techniques of molecular biology, biochemistry and biophysics.
Students should be able to:
- plan and conduct experiments using different techniques
- Perform a research program
- evaluate the results on the basis of theoretical knowledge and literature
- present (and critically discuss) the results in the form of a journal article

Inhoud vak
During this course the students will perform a research program focused on the study of photoactive proteins involved in the photosynthetic process. Pigment-proteins will be purified from plants or overexpressed in E.coli and reconstituted in vitro. A series of mutants will also be prepared/analyzed. The pigment-proteins complexes will be studied with a large set of biochemical and spectroscopic techniques (both steady-state and time-resolved). The data will be analyzed in detail and the results of the different experiments integrated to obtain information about the properties of the complexes and the effect of specific mutations. The experiments will be performed in small groups.

Onderwijsvorm
Laboratory work Lectures Tutorials

Literatuur
Litterature and study matherial will be provided by the teacher

Doelgroep
Master students in biomolecular sciences (AM_BMOL)

Overige informatie
Teaching staff: PhD students of the biophysics group

Project Computational Design and Synthesis of Drugs

Vakcode	X_432734 ()
Periode	Periode 4
Credits	6.0
Voertaal	Engels
Faculteit	Faculteit der Exacte Wetenschappen
Coördinator	dr. C. de Graaf
Examinator	dr. C. de Graaf
Docent(en)	dr. M. Wijtmans, dr. C. de Graaf, dr. D.P. Geerke
Lesmethode(n)	Hoorcollege, Practicum
Niveau	400

Doel vak
To gain insight and experience in the molecular modeling tools that enable (rational) drug design and to examine and plan efficient routes to synthesize conceived ligands.

Inhoud vak
In the post-genome era, an overwhelming amount of data describing the molecular characteristics of the targets is becoming available. For example, the structure of many proteins is being determined using X-Ray analysis and NMR techniques. Furthermore, high-throughput screening results in massive amounts of data that reveal the molecular properties of the ligands that are able to have interaction with the drug targets. In this project, several techniques that can help to translate this data into novel ligands will be discussed and applied. Specific topics include crystal structure analysis, the building of homology models, docking of ligands, calculating binding free energy and affinity of ligands for the protein, de novo structure generation, and pharmacophore modeling. These techniques generate ideas for novel compounds. Because a design that cannot be synthesized is by definition a useless design, the synthetic feasibility is a key and integral part of the design process. Therefore, it is important to be able to define a synthetic pathway for the preparation of the designed compounds. In this project, this aspect will be covered by lectures on the concept of retrosynthesis and on the incorporation of some biologically relevant moieties, such as heteroatoromatic scaffolds and known affinity-increasers. An online retrosynthetic demonstration with a search engine sets the stage for a case study. For a specific design, a versatile and robust synthesis route has to be defined. A thorough literature search, in combination with detailed study of the reactions involved will result in a report that describes the suggested chemistry in detail.

Onderwijsvorm
Project basis: including lectures, tutorials, self study, assignments and group-work on a case-study.

Toetsvorm
Written examination, preparation of a report.

Vereiste voorkennis
Knowledge of basic organic chemistry.

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

Protein Science

Vakcode	AM_470145 ()
Periode	Periode 1
Credits	6.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. D. Bald
Docent(en)	dr. M.H. Siderius, prof. dr. ir. E.J.G. Peterman, dr. J.N.M. Commandeur, dr. D. Bald, prof. dr. M.J. Smit
Lesmethode(n)	Hoorcollege, Werkgroep
Niveau	400

Doel vak
Repeat and deepen knowledge and understanding of protein structure, function, dynamics and regulation. Getting an overview of current methods for protein to expression, purification and investigation of protein/protein interaction.
The focus will be on general methods that you can apply to answer a wide range of biochemical, biomedical and biotechnical questions.
The student should know:
Principles of protein structure, function, dynamics, inhibition and engineering
Background of current protein science techniques

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

Onderwijsvorm
Lectures (30h) accompanied by work discussions (4 h) and self study (individual or in small groups) to prepare for the lectures and to and discuss the material presented in lectures or the accompanying papers.

Toetsvorm
Written exam

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

Doelgroep
Master students Biomolecular Sciences, Biomedical Sciences, Biology, Pharmaceutical Sciences and Medical Natural Sciences

Overige informatie
Visiting lecturer: Dr. Anil Koul, Tibotec J&J

Protein Sciences Techniques

Vakcode	AM_470641 ()
Periode	Periode 3
Credits	3.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. D. Bald
Docent(en)	dr. D. Bald
Lesmethode(n)	Hoorcollege
Niveau	400

Doel vak
Practice advanced protein science methods that you can apply to answer a wide range of biochemical, biomedical and biotechnical questions. The student should be able to apply current methods for protein expression, purification, protein labelling, as well as for investigation of protein/protein or protein/drug interaction.

Final attainment:
The student understands, can apply and interpret advanced practical approaches for investigation of proteins.

Inhoud vak
We will start with a brief repetition of the theoretical background of current protein science techniques. Subsequently, we will focus on application of selected techniques in the lab.
Techniques/practical include:
Over-expression of proteins;
Advanced chromatography methods for protein purification;
Surface Plasmon Resonance Sensing (Biacore) for protein/protein or

protein/drug interaction;
Functionalized Micro-beads for affinity interaction/labeling.

Onderwijsvorm
Laboratory practical (16h) accompanied by a lecture (4h) and self-study to prepare for the practical, evaluate experimental results and write reports.

Toetsvorm
Active participation in the practical (50%), written reports (50%)

Literatuur
You will receive a course material with background information and experimental protocols.

Vereiste voorkennis
Participation in the portal course Protein Science (470145) is required.

Doelgroep
Master students Biomolecular Sciences, Biomedical Sciences, Biology, Pharmaceutical Sciences and Medical Natural Sciences

Overige informatie
Maximal number of participants is 40. A lab coat is required for the practical.

Scientific Writing in English

Vakcode	AM_471023 ()
Periode	Ac. Jaar (september)
Credits	3.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	M. van den Hoorn
Lesmethode(n)	Werkgroep
Niveau	400

Doel vak
The aim of this course is to provide Master's students with the essential linguistic know-how for writing a scientific article in English that is well organized idiomatically and stylistically appropriate and grammatically correct.
At the end of the course students
- know how to structure a scientific article;
- know what the information elements are in parts of their scientific article;
- know how to produce clear and well-structured texts on complex subjects;
- know how to cite sources effectively;
- know how to write well-structured and coherent paragraphs;
- know how to construct effective sentences;
- know what collocations are and how to use them appropriately;
- know how to adopt the right style (formal style, cohesive style, conciseness, hedging)
- know how to avoid the pitfalls of English grammar;

- know how to use punctuation marks correctly;
- know what their own strengths and weaknesses are in writing;
- know how to give effective peer feedback.

Final texts may contain occasional spelling, grammatical or word choice errors, but these will not distract from the general effectiveness of the text.

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

Topics addressed during the course include the following:
- Structuring a scientific article
- Considering reading strategies: who is your readership? How do they read your text? What do they expect? How does that affect your writing?
- Writing well-structured and coherent paragraphs
- Composing effective sentences (sophisticated word order, information distribution).
- Arguing convincingly – avoiding logical fallacies
- Academic tone and style: hedging – why, how, where?
- Using the passive effectively
- Understanding grammar (tenses, word order, etc.)
- Understanding punctuation
- Referring to sources: summarising, paraphrasing, quoting (how and when?)
- Avoiding plagiarism
- Vocabulary development: using appropriate vocabulary and collocations

Onderwijsvorm
Scientific Writing in English is an eight-week course and consists of 4 contact hours during the first week and 2 contact hours a week for the rest of the course. Students are required to spend at least 6 to 8 hours of homework per week. They will work through a phased series of exercises that conclude with the requirement to write several text parts (Introduction, Methods or Results section, Discussion and Abstract). Feedback on the writing assignments is given by the course teacher and by peers.

Toetsvorm
Students will receive the three course credits when they meet the following requirements:
- Students hand in three writing assignments (Introduction, Methods or Results, Discussion) and get a pass mark for all writing assignments;
- Students provide elaborate peer feedback;
- Students attend all sessions;
- Students are well prepared for each session (i.e. do all homework assignments);
- Students actively participate in class;
- Students do not plagiarise or self-plagiarise.

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

Doelgroep
This course is only open to students of the Master's programmes of the Faculty of Earth and Life Sciences mentioned below. These students are only eligible to the course if they have already conducted scientific research (e.g. for their Bachelor's thesis) or if they will be working on a research project when taking Scientific Writing in English.

Faculty of Earth and Life Sciences - Master's programmes:
- Biology;
- Health Sciences;
- Ecology;
- Biomolecular Sciences;
- Biomedical Sciences;
- Neurosciences;
- Global Health;
- Management, Policy Analysis and Entrepreneurship in Health and Life Sciences.

Overige informatie
- To do well, students are expected to attend all lessons. Group schedules are to be found at rooster.vu.nl and on Blackboard.
- A VUnet registration for this course is necessary in order to enroll or be enrolled in a Blackboard group. The VUnet registration automatically gives access to the corresponding Blackboard site.
- Group enrollment only takes place via Blackboard. For open/general groups: students have to enroll themselves following FALW programmes containing this course. For group assigned to specific studies, students are enrolled by the course coordinator).
- Make sure Scientific Writing in English does not overlap with another course.
- If you have registered for a group in Blackboard, you are expected to attend all sessions (eight). If you decide to withdraw from the course, do so in time, both on Blackboard and in VUnet. This all will avoid a 'fail' on your grade list for not taking part in this course and allows other students to fill in a possible very wanted group spot.
- If you (expect to) miss a session, please inform the group trainer as soon as possible. If you miss a session without notification, you may not be able to finish the course.
- For any questions concerning this course, please contact the course coordinator Marieke Zantkuijl: m.c.l.zantkuijl@vu.nl

Signal Transduction in Health and Disease

Vakcode	X_432535 (432535)
Periode	Periode 2
Credits	6.0
Voertaal	Engels
Faculteit	Faculteit der Exacte Wetenschappen

Coördinator	prof. dr. M.J. Smit
Docent(en)	dr. M.J. Smit
Lesmethode(n)	Hoorcollege
Niveau	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

Structural Bioinformatics

Vakcode	X_405019 (405019)
Periode	Periode 4
Credits	6.0
Voertaal	Engels
Faculteit	Faculteit der Exacte Wetenschappen
Coördinator	dr. ir. K.A. Feenstra
Docent(en)	dr. ir. K.A. Feenstra, dr. S. Abeln
Lesmethode(n)	Hoorcollege, Practicum

Niveau	400

Doel vak
Why Structural Bioinformatics?
Generally speaking, the function of a protein is determined by its three dimensional structure, and therefore structural information is crucial for understanding the working of proteins. However, experiments, prediction and simulation of protein structures remain difficult. This course will provide you an overview of existing computational techniques, to validate, simulate, predict and analyse protein structures. More importantly, it will provide practical knowledge about how and when to use such techniques.

Goals:
• Being able to evaluate protein structures with knowledge of their experimental source and validation techniques
• Being able to compare different protein structures, and evaluate similarity
• Learning how and when to use structure prediction methods
• Being able to create scripts that connect different Structural Bioinformatics methods.
• Being able to compare different simulation techniques for biological macro-molecules, and be able to analyse the simulated data computationally.
• Reading and understanding scientific papers in the field of Structural Bioinformatics.

Inhoud vak
Theory:
• Protein and DNA structure sources
• Experimental methods
• Structure validation
• Protein fold prediction (from homology modelling to ab initio prediction)
• Structural classification and structural alignment
• Protein folding and energetics
• Molecular Dynamics simulation, &Monte Carlo simulation
• Function from structure

Practical:
• Obtaining geometric features from PDB files
• Homology modelling with Modeller
• Protein unfolding as a 'computational experiment' (simulation).

Onderwijsvorm
13 Lectures (2 two-hour lectures per week)
12 computer practicals (2 two-hour sessions per week)
Feedback (theoretical and practical) will be given during the computer practical sessions.

Toetsvorm
The final grade for this course will consist of 50% practical work and 50% theoretical assessment.

Practical Assignments: (50%)
(1) Obtaining geometric features from PDB files
(2) Homology modelling with Modeller (including structural alignment)
(3) Protein unfolding as a 'computational experiment' (simulation).

Theoretical: (50%)
• Oral or written exam (depending on number of course students).
• As part of the exam a research paper on a Structural Bioinformatics topic needs to be analysed in detail.
• You will be prepared for you exam through exercises and paper discussion during the lectures

Literatuur
- course material on bb.vu.nl
- Marketa Zvelebil and Jeremy O. Baum Understanding Bioinformatics Garland Science 2008 ISBN-10: 0-8153-4024-9

Aanbevolen voorkennis
Bachelor in any science discipline (including medicine).
Basic scripting skills (e.g. Python or Pearl) and an interest in biological problems. Note that at the start of the course a small scripting practical will be given, this means that in practice students without scripting experience can follow the course if they are motivated to learn during the course.

Doelgroep
mAI, mBio, mCS

Overige informatie
- Compulsory course for students in Bioinformatics Profile of MSc Bioinformatics & Systems Biology (mBIO).
- Optional course for mAI, mCS, mPDCS, mMNS, mBMOL, mNS, mBIO

Thesis Based on Literature Study

Vakcode	AM_471153 ()
Periode	Ac. Jaar (september)
Credits	9.0
Voertaal	Engels
Faculteit	Fac. der Aard- en Levenswetenschappen
Coördinator	dr. H.S. van Walraven