Minor Biomolecular and Neurosciences track Neuroscience 2017-2018
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Experimental Cell Biology I

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<td>Periode</td>
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<tr>
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<td>Voertaal</td>
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<tr>
<td>Faculteit</td>
<td>Fac. der Aard- en Levenswetenschappen</td>
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<tr>
<td>Coördinator</td>
<td>dr. D. Bald</td>
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<tr>
<td>Examinator</td>
<td>dr. D. Bald</td>
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<tr>
<td>Lesmethode(n)</td>
<td>Practicum, Werkgroep, Hoorcollege</td>
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<td>Niveau</td>
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**Doel vak**
The student has insight in biological processes fundamental in living cells. The student has an overview of techniques used in Cell Biology. The student can work with scientific literature.

**Inhoud vak**
We start with a brief repetition of basic Cell Biology and then go ahead with in-depth discussion of modern Cell Biology, with a particular focus on current and emerging experimental techniques. In Research Lectures, current topics in Cell Biology will be discussed.

Topics:
- General cell organization and function, protein, DNA and RNA function, cell cycle and (programmed) cell death
- Transcription factors, gene expression, and epigenetics
- Protein modification, sorting, and membrane transport
- Receptors and signal transduction
- Basic techniques in Cell Biology (PCR, Electrophoresis, ELISA)
- Current models organisms in Cell Biology (e.g. E. coli, yeast, C. elegans, drosophila, zebra fish, mammalian models)
- Visualization techniques in Cell Biology

Each student will also work on a literature assignment.

**Onderwijsvorm**
Lectures (26h), work discussions related to the literature assignment (6h), self-study in groups to repeat lecture material and for literature assignment.

**Toetsvorm**
Written exam (2/3), literature assignment (1/3)

**Literatuur**
No book mandatory. Useful books are:
Alberts et al. Molecular Biology of the Cell (more extensive, recommended for Biomolecular track) or
**Aanbevolen voorkennis**
Basic (first and second year level) courses in Cell Biology

**Overige informatie**
Compulsory portal course Minor Biomolecular Sciences and Neurosciences.
This minor course requires a minimum of 25 participants to take place.
This course is offered in week 1-4 of period 1 and is to be taken together with the accompanying course Experimental Cell Biology II.
This course is based on first and second year level courses in Cell Biology.

**Experimental Cell Biology II**

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**Doel vak**
The student has an overview of advanced techniques in Cell Biology. The student is acquainted with current open questions and on-going developments in Cell Biology.
The student can use the gained knowledge in Cell Biology for the design of a research proposal.

**Inhoud vak**
In-depth discussion of modern Cell Biology, with a particular focus on current and emerging experimental techniques. In Research Lectures, current state-of-the-art topics in Cell Biology will be discussed.

Lecture topics include advanced -omic approaches, such as genomics, proteomics, metabolomics and interactomics.
Research lectures on
- Protein (GFP) labeling and visualization techniques
- (Confocal) Microscopy and Live Cell Imaging
- Proteomics and mass spectrometry
- Systems Biology
- Knock-out and RNAi techniques
- Interactomics techniques
The student will work out and submit a research proposal on a chosen topic in Cell Biology (group work).

**Onderwijsvorm**
Lectures (28 h), work discussions related to the research proposal (6h)
self-study in
groups to repeat lecture material and for research proposal.

**Toetsvorm**
Written exam (2/3), research proposal (1/3)

**Literatuur**
No book mandatory. Useful books are:
Alberts et al. Molecular Biology of the Cell (more extensive,
recommended for Biomolecular track)
Alberts et al. Essential Cell Biology (more concise, recommended for
Neurobiology track).
For the research proposal you will also work with scientific literature
relevant for the chosen topic (search/discuss in small groups).

**Vereiste voorkennis**
This course is to be taken together with the accompanying course
Experimental cell Biology I.

**Aanbevolen voorkennis**
Basic (first and second year level) courses in Cell Biology,
participation in Experimental Cell Biology I.

**Overige informatie**
Compulsory portal course of the minor Biomolecular Sciences and
Neurosciences.
This minor course requires a minimum of 25 participants to take place.
This course is offered in weeks 5-8 of period 1 and is to be taken
together with the course
Experimental cell Biology I (in week 1-4 of period 1).

Guestlecture:
Dr. J. van Buul (Sanquin). Basic (first and
second year level) courses in Cell Biology,
participation in Experimental Cell Biology I.

**Molecular Principles of Brain Disorders**

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<td><strong>Lesmethode(n)</strong></td>
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**Doel vak**
Gain insight into the etiology, expression and treatment of various
brain diseases, as well as models used in preclinical science.
**Inhoud vak**
Our brain enables us to perform even the most complex tasks. Sometimes however, diseases of the brain compromise its optimal function. In this course students learn what the clinical manifestations are of the neurological and psychiatric diseases, and what type of cellular or animal models are around to learn us more on how disturbed processes and systems in the brain lead to these illnesses and that may provide us with clues on treatment options. Various treatments options for these conditions, including the use of pharmacological agents and deep brain stimulation will be discussed.

In this course we will focus on a different themes:
- Theme 1: Neurodegenerative disorders (coordinator Dr. Wiep Scheper)
- Theme 2: Psychiatric disorders (coordinator Dr. Hylke Vervaeke)
- Theme 3: Neurodevelopmental disorders of intellectual disability and autism (coordinator Dr. Rhiannon Meredith)

Next, you will be guided in writing a literature review.

**Onderwijsvorm**
Lectures (44 hours) and literature review (12 hours)

Course coordinators are Hylke Vervaeke and Rolinka Schippers

**Toetsvorm**
Exam (Multiple Choice) (60%), literature study (40%), each at least grade 5.5

**Literatuur**
Powerpoints from the lecture and extra literature on Canvas

**Aanbevolen voorkennis**
Basic (first and second year level) courses in Cell Biology and Neurosciences

**Doelgroep**
Course in the track 'Neurosciences' in the minor 'Biomolecular Sciences and Neurosciences'.

Course in the minor 'Topics in Biomedical Sciences'

**Intekenprocedure**
Groups for literature review via Canvas

**Overige informatie**
The track ‘Neurosciences’ is an excellent preparation for the Master Neurosciences.

This minor course requires a minimum of 25 participants and a maximum of 150.

This course is part of the Minor Neurosciences and the minor Topics in Biomedical Sciences. Students from both minors have priority.

**Neuronal Networks and Behavior**

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**Doel vak**
This course is designed for life sciences students who want to learn more about how networks of brain cells control behaviour. To this end, we will discuss different aspects of brain function covering sensory information processing, control of movement, learning and memory, spatial navigation, cognition, emotions. We will focus on how neuronal networks in different brain areas give rise to these functions. After completing this course the students will be able to:

1. Explain the biological basis of perception (vision, auditory processing, smell and taste), motor and behavioural control, and cognitive and emotional processes. In addition, you will get an understanding of the neurobiological basis of a number of neurological and psychiatric disorders.
2. Explain the general plan of human sensory and movement systems.
3. Apply this general plan to explain the differences and similarities between different sensory systems.
4. Give examples of how and through which neurons and nuclei signal transduction proceeds during interaction of the human brain with the external environment.
5. Apply this knowledge in performing scientific research themselves.
6. Create new research ideas based on the learned practical and theoretical knowledge.

The students will develop the following academic skills:
1. Search for and read scientific literature, extract important information.
2. Utilise the theoretical background from course lectures and practicals to critically evaluate neuroscience research, formulate critical questions and participate in discussion.
3. Acquire hands-on experience in recording from neuronal networks, conducting experiments and analyzing own data. The students will learn how to stimulate neurons and record synaptic communication within neuronal networks, induce synaptic learning.
4. Design and conduct own experiment based on the learned technique
5. Develop practical experimentation skills on analysis of human startle responses and its sensory and emotional modulation.
6. Summarise the experimental results in a lab report

**Inhoud vak**
In Neuronal Networks & Behaviour we will discuss different aspects of brain function ranging from sensory information processing, control of movement, learning and memory to cognition and emotions. We will study how neuronal networks in different brain areas give rise to these functions. To achieve this, we will use a combination of lectures,
written assignments and practicals. These will build on chapters from the book ‘Neuroscience’ by Purves and colleagues (5th edition).

To actively engage you in exploring the exciting territory of neurons that shape our behaviour, the first two weeks will be centred on working on assignments. These assignments are designed to help you prepare for the lectures. In this way the lectures will go deeper on the subjects that you already worked on through the assignment and will resolve the questions that may arise during this preparation. During the lecture we will often work in smaller groups to discuss the material. In the second week, a series of practicals will start. During the first practical you will perform experiments on neuronal networks in brain slices and will learn basic principles of neuronal network function. You will even have an opportunity to design and perform your own experiment under supervision. The second practical takes you to experimenting with behaviour and modulation of sensory information processing. Here you can be the subject of the experiment yourself.

Onderwijsvorm
1. Assignments
A system of short Turnitin Assignments was designed to help you with mastering the course material and prepare for the lectures. You will receive at each lecture during the first 2 weeks a short list of questions that you will complete and send using Turnitin Assignments on BB before the next lecture. The questions will be discussed during the subsequent lecture. If you submit all the assignments on time you will get 0.5 extra points added to your exam grade. The primary goal of these assignments is not to find the correct answers but for you to discover difficult issues before the lecture, so that we can adequately address your questions. Completion of all assignments is obligatory for all students.

2. Lectures (l) by dr. N. Goriounova and dr. O. Stiedl
The first day will start with an opening lecture during which the aims of the course are highlighted. The first week will contain lectures on sensory systems; during the second week we will discuss the motor control of behavior memory and cognition. You are expected to complete the assignments before the lectures so that we can discuss the topics and address unclear issues in depth.

Hours per student: 24 hrs

3. Hippocampal brain slice practical (pra) by J. Timmerman
In the second week, the practicals on neuronal networks from the hippocampus will expose you to the actual experimentation that is done to understand functioning of neuronal networks. It will provide you with an insight with what it takes to do research, and it will help you to understand some of the concepts discussed in the course. During the practicals, we will divide the class into multiple small teams of maximum 12 students. You will work in groups of 3 on one experimental setup.

Hours per student: 4

4. Startle eye-blink practical (pra) by dr. O. Stiedl
In the third week, experiments on human subjects are performed with an emphasis on startle reflex modulation in humans. In addition, a number of key primary research articles are discussed that facilitate the understanding of which brain areas are involved in emotional learning and central reflex modulation.

Hours per student: 5
Toetsvorm
The grading procedure will be as follows:
1. Assignments (A): pass/fail. All assignments are to be submitted
2. Practicals (P): pass/fail. Participation in practicals is obligatory
3. Written reports (R): from the practicals corrected after tutor’s feedback. Report electrophysiology practical 10% of the final grade; report startle reflex practical 10%.
4. Written exam (E) consisting of open questions 80%
5. Bonus points of 0.5 added to the exam grade in case all assignments are well done and submitted before deadlines

Grades for the reports and exam should be at least 5.5 and can non compensate each other

Reexamination:
Written exam (E)

Literatuur

Up-to-date course materials are posted on the site to which all students and lecturers have access. Background information for this course, relevant literature and copies of all lecture PowerPoints will be provided in the Course Documents folder on Canvas.

Vereiste voorkennis
Understanding of cell biology, neuronal communication and neuro-anatomy.

Purves et al (5th edition) "Neuroscience" Chapters 1-8

Aanbevolen voorkennis
Basic (first and second year level) courses in Cell Biology and Neurosciences.

Doelgroep
This course is part of the track ‘Neurosciences’ of the minor ‘Biomolecular Sciences and Neurosciences’.

Overige informatie
In addition to the lectures and practicals, we will pay attention to the development of a number of important academic skills: presenting scientific information in an oral presentation, reading and understanding primary research articles, and designing experiments. These skills will not only be crucial later in your scientific career, but will also help you to learn to distinguish main topics and messages from side issues when preparing for the lectures of your fellow students, or even when preparing your exam.

The track ‘Neurosciences’ is an excellent preparation for the Master Neurosciences.

This minor course requires a minimum of 25 participants to take place.

The Adaptive Brain
Doel vak
Gain insight into molecular and cellular neurobiology, with a focus on adaptive mechanisms in the brain. Practice molecular and cellular biological laboratory skills.

Inhoud vak
Molecular signal transduction, synaptic plasticity, early brain development, construction of neural circuits, modification of brain circuits as a result of experience, repair and regeneration in the nervous system.

Onderwijsvorm
Lectures (16 hours), laboratory practical (16 hours), journal clubs (12 hours), student presentations (4 hours).

The focus of this course is on scientific experiments: a laboratory practical on molecular biological techniques and journals clubs in which scientific papers are discussed.

Toetsvorm
Exam (Multiple Choice) (60%); student presentation laboratory practical (20%), journal club presentation (20%) each at least grade 5.5

Literatuur

Vereiste voorkennis
Understanding in cell biology, neuronal communication and neuro-anatomy. This course is suitable for third year BSc students in the life sciences. Students Biomedical Science or Health and Life science track Biomedical Science can register directly. Students from other studies or other universities please send a brief CV with grade list to Ruud Toonen (ruud.toonen@cnocr.vu.nl). Admission will be decided based on previous education and achieved grades.

Aanbevolen voorkennis
Understanding in cell biology, neuronal communication and neuro-anatomy

Doelgroep
Course in the track ‘Neurosciences' in the minor 'Biomolecular Sciences and Neurosciences'.

Overige informatie
The track ‘Neurosciences’ is an excellent preparation for the Master Neurosciences.
This minor course requires a minimum of 25 participants to take place.