<table>
<thead>
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<th>Course Code</th>
<th>Course Title</th>
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<tbody>
<tr>
<td>gsw090</td>
<td>Current Topics in Clinical Research</td>
<td>40</td>
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<tr>
<td>gsw100</td>
<td>Immunology and Inflammation</td>
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<td>gsw110</td>
<td>Clinical Aspects of Degenerative Diseases</td>
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<tr>
<td>gsw120</td>
<td>Tumor Biology</td>
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<tr>
<td>gsw130</td>
<td>Regenerative Medicine in Ophthalmology</td>
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<tr>
<td>gsw150</td>
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<td>49</td>
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<tr>
<td>gsw160</td>
<td>External Research Project Molecular Biomedicine</td>
<td>51</td>
</tr>
<tr>
<td>gsw170</td>
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<td>52</td>
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<tr>
<td>gsw180</td>
<td>Ethics in Medicine</td>
<td>53</td>
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<tr>
<td>gsw190</td>
<td>Journal Club</td>
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<tr>
<td>gsw200</td>
<td>Microscopic Imaging in Biomedical Sciences</td>
<td>55</td>
</tr>
<tr>
<td>neu751</td>
<td>Laboratory Animal Science</td>
<td>56</td>
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<tr>
<td>neu760</td>
<td>Scientific English</td>
<td>58</td>
</tr>
<tr>
<td>gsw210</td>
<td>Scientific Communication</td>
<td>60</td>
</tr>
<tr>
<td>gsw220</td>
<td>Bioinformatics and Omics</td>
<td>62</td>
</tr>
<tr>
<td>gsw215</td>
<td>Introduction to Academic Writing</td>
<td>63</td>
</tr>
<tr>
<td>mam</td>
<td>Master Thesis Module</td>
<td>64</td>
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</table>
**Background Modules**

**bio605 - Molecular Genetics and Cell Biology**

<table>
<thead>
<tr>
<th>Module label</th>
<th>Molecular Genetics and Cell Biology</th>
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<tbody>
<tr>
<td>Modulkürzel</td>
<td>bio605</td>
</tr>
<tr>
<td>Credit points</td>
<td>12.0 KP</td>
</tr>
<tr>
<td>Workload</td>
<td>360 h</td>
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**Verwendbarkeit des Moduls**

- Master's Programme Biology (Master) > Background Modules
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Molecular Biomedicine (Master) > Background Modules
- Master's Programme Neuroscience (Master) > Background Modules

**Zuständige Personen**

- Neidhardt, John (module responsibility)
- Neidhardt, John (Prüfungsberechtigt)
- Koch, Karl-Wilhelm (Prüfungsberechtigt)
- Jüschke, Christoph (Prüfungsberechtigt)

**Prerequisites**

- BSc (Biologie, Biochemie)

**Skills to be acquired in this module**

++ deepened biological expertise
++ deepened knowledge of biological working methods
++ interdisciplinary thinking
+ critical and analytical thinking
+ independent searching and knowledge of scientific literature
+ data presentation and discussion (E) (written and spoken)
+ teamwork
+ ethics and professional behaviour
+ project and time management

Addressing students with an emphasis on molecular biology, molecular genetics, cell biology, and neurobiology

**Module contents**

Lecture: To improve knowledge in molecular genetics, molecular biology and cell biology in correlation with human diseases. Exercise: Learn to transfer the theoretical knowledge to experiments. Gaining methodological knowledge in molecular genetics, cell biology and therapeutic approaches. Initial training on how to perform research projects. Subjects of the lecture and seminar: Molecular bases of neurodegenerative diseases, structure and function of DNA/RNA/proteins/membranes, cytoskeleton, cell cycle, programmed cell death, cells in the social structure. Exercises: Learning current methods of molecular biology and human genetics; high throughput technologies, introduction to cell cultivation techniques.

**Literaturempfehlungen**

Textbooks of Cell Biology

**Links**

http://www.uni-oldenburg.de/humangenetik/

**Language of instruction**

English

**Duration (semesters)**

1 Semester

**Module frequency**

**Module capacity**

15

**Reference text**

associated with bio900

**Modullevel / module level**

**Modulart / typ of module**

**Lehr-/Lernform / Teaching/Learning method**

**Vorkenntnisse / Previous knowledge**

**Examination**

Prüfungszeiten

- written examination (70 %), paper(s) presentation 30 %; not graded: signed lab protocols, regular active participation is required for the module to be passed.

**Form of instruction**

<table>
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<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload of compulsory attendance</th>
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4 / 66
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<td>1</td>
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<td>Exercises</td>
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### Module Information

**bio695 - Biochemical concepts in signal transduction**

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<td>Master's Programme Molecular Biomedicine (Master) &gt; Background Modules</td>
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<td></td>
<td>Master's Programme Neuroscience (Master) &gt; Background Modules</td>
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<td>Zuständige Personen</td>
<td>Koch, Karl-Wilhelm (module responsibility)</td>
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<td>Koch, Karl-Wilhelm (Prüfungsberechtigt)</td>
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<td>Scholten, Alexander (Prüfungsberechtigt)</td>
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<td>Scholten, Alexander (Module counselling)</td>
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<td>Prerequisites</td>
<td>keine</td>
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<tr>
<td>Skills to be acquired in this module</td>
<td>++ deepened knowledge of biological working methods</td>
</tr>
<tr>
<td></td>
<td>++ methods: protein expression and purification, functional assays, enzyme kinetics, spectroscopic techniques</td>
</tr>
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<td></td>
<td>++ data analysis skills</td>
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<tr>
<td></td>
<td>+ interdisciplinary thinking</td>
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<td></td>
<td>++ critical and analytical thinking</td>
</tr>
<tr>
<td></td>
<td>+ independent searching and knowledge of scientific literature</td>
</tr>
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<td></td>
<td>+ ability to perform independent biological research</td>
</tr>
<tr>
<td></td>
<td>++ data presentation and discussion in German and English (written and spoken)</td>
</tr>
<tr>
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<td>++ teamwork</td>
</tr>
<tr>
<td></td>
<td>+ project and time management</td>
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<tr>
<td>Module contents</td>
<td>Lecture: Molecular fundamentals of cellular signal processes</td>
</tr>
<tr>
<td></td>
<td>Seminar: Signal transduction</td>
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<tr>
<td></td>
<td>Exercises: Experiments on cellular signal transduction and enzymology</td>
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<tr>
<td></td>
<td>Mechanisms of biochemical signal transduction are imparted theoretically and experimentally</td>
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<tr>
<td>Literatureempfehlungen</td>
<td>Textbooks of cell biology and biochemistry. Current literature on topics of signal transduction (as announced in the preparatory meeting).</td>
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<tr>
<td>Language of instruction</td>
<td>English</td>
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<td>Duration (semesters)</td>
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<td>Module frequency</td>
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<tr>
<td>Modulart / typ of module</td>
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<tr>
<td>Lehr-/Lernform / Teaching/Learning method</td>
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<td>Vorkenntnisse / Previous knowledge</td>
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<tr>
<td>Examination</td>
<td>Prüfungszeiten</td>
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<td></td>
<td>Type of examination</td>
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<td>Final exam of module</td>
<td>90 minutes written exam</td>
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<td></td>
<td>written examination (50%) protocolls (50%)</td>
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<td>Prerequisite for passing the module is active participation: Presentation(s) in the seminar</td>
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<td>Comment</td>
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<td>SWS</td>
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<td>WiSe</td>
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<td>Präsenzzeit Modul insgesamt</td>
<td>112 h</td>
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**Language of instruction**: English

**Duration (semesters)**: 1 Semester

**Module frequency**: 1 Semester

**Module capacity**: 20

**Modul level/module level**: 1 Semester

**Prerequisites**: keine

**Skills to be acquired in this module**: ++ deepened knowledge of biological working methods ++ methods: protein expression and purification, functional assays, enzyme kinetics, spectroscopic techniques ++ data analysis skills + interdisciplinary thinking ++ critical and analytical thinking + independent searching and knowledge of scientific literature + ability to perform independent biological research ++ data presentation and discussion in German and English (written and spoken) ++ teamwork + project and time management

**Module contents**: Lecture: Molecular fundamentals of cellular signal processes Seminar: Signal transduction Exercises: Experiments on cellular signal transduction and enzymology

**Literatureempfehlungen**: Textbooks of cell biology and biochemistry. Current literature on topics of signal transduction (as announced in the preparatory meeting).

**Language of instruction**: English

**Duration (semesters)**: 1 Semester

**Module frequency**: 1 Semester

**Module capacity**: 20

**Modul level/module level**: 1 Semester

**Prerequisites**: keine
### gsw010 - Molecular Physiology

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<td>Verwendbarkeit des Moduls</td>
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<td>Master's Programme Molecular Biomedicine (Master) &gt; Background Modules</td>
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<tr>
<td>Zuständige Personen</td>
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<tr>
<td>Milenkovic, Ivan (module responsibility)</td>
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<td>Radulovic, Tamara (Prüfungsberechtigt)</td>
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<td>Keine, Christian (Prüfungsberechtigt)</td>
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</tr>
<tr>
<td>Radulovic, Tamara (Module counselling)</td>
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<tr>
<td>Milenkovic, Ivan (Module counselling)</td>
<td></td>
</tr>
<tr>
<td>Prerequisites</td>
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<tr>
<td>Enrolment in Master’s programme Molecular Biomedicine; Knowledge of cell biology is beneficial for comprehension of lecture content</td>
<td></td>
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<tr>
<td>Skills to be acquired in this module</td>
<td>Goals of the Module:</td>
</tr>
<tr>
<td>- know molecular mechanisms of cellular physiology</td>
<td></td>
</tr>
<tr>
<td>- know physiology of the following human body organ systems: muscular system, nervous system, cardiovascular system, respiratory system, urinary system</td>
<td></td>
</tr>
<tr>
<td>- understand pathophysiology of certain diseases</td>
<td></td>
</tr>
<tr>
<td>- know basic principles of functional tests for certain organ systems.</td>
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<tr>
<td>Competencies:</td>
<td></td>
</tr>
<tr>
<td>++ deepened biological expertise</td>
<td></td>
</tr>
<tr>
<td>++ deepened clinical/pathological expertise</td>
<td></td>
</tr>
<tr>
<td>++ deepened knowledge of medical diagnostic methods</td>
<td></td>
</tr>
<tr>
<td>+ data analysis and clinical interpretation</td>
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<tr>
<td>+ interdisciplinary thinking</td>
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<td>Module contents</td>
<td>The module focuses on physiology of the cell, physiology of human organ systems in health and disease, homeostatic regulation mechanisms</td>
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<td>Lecture topics:</td>
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<td>1. Cellular mechanisms of excitability</td>
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<td>2. Synaptic transmission</td>
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<td>3. Muscle contraction</td>
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<td>4. Spinal cord reflexes</td>
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<td>5. Motor skills</td>
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<tr>
<td>6. Basic principles of circulatory function</td>
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</tr>
<tr>
<td>7. Pulmonary ventilation</td>
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<td>8. Regulation of respiration</td>
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<td>9. General sensory physiology</td>
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<td>10. Physiology of special senses</td>
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<td>11. Kidneys</td>
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<td>12. Water homeostasis and osmoregulation</td>
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<td>Exercise:</td>
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<tr>
<td>1. Excitability of nerve cells and AP propagation</td>
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<tr>
<td>2. Reflexes</td>
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<tr>
<td>3. Electrocardiography</td>
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<td>4. Pulmonary function tests and regulation of respiration</td>
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<tr>
<td>5. Functional tests for sensory systems</td>
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<tr>
<td>6. Water and osmolarity homeostasis</td>
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<tr>
<td>Literatureempfehlungen</td>
<td>Guyton and Hall - Textbook of medical physiology (covers most topics)</td>
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<td></td>
<td>Kandler, Schwarz , Jessell - Principles of neural science</td>
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<td></td>
<td>Gary G. Matthews – Cellular Physiology of Nerve and Muscle</td>
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<td>Links</td>
<td><a href="https://uol.de/physiologie">https://uol.de/physiologie</a></td>
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<td>Language of instruction</td>
<td>English</td>
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<td>Duration (semesters)</td>
<td>1 Semester</td>
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<tr>
<td>Module frequency</td>
<td>winter and summer semester</td>
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<tr>
<td>Module capacity</td>
<td>10 (participation at lectures is not restricted)</td>
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<td>Reference text</td>
<td>The number of participants for the practical part of this module is limited to 10. Students which are enrolled in Master’s programme Molecular Biomedicine will be preferred.</td>
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<td>MM (Mastermodul / Master module)</td>
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<td>Wahlpflicht / Elective</td>
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<td>Vorkenntnisse / Previous knowledge</td>
<td>Basic knowledge in physiology and cell biology</td>
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<td>Prüfungszeiten</td>
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<tr>
<td>Lecture</td>
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<td>SoSe und WiSe</td>
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<td>Practical training</td>
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<td>SoSe und WiSe</td>
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Präsenzzeit Modul insgesamt 56 h
### gsw020 - Cellular and Subcellular Structures

<table>
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<th>Module label</th>
<th>Cellular and Subcellular Structures</th>
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<td>Credit points</td>
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<tr>
<td>Workload</td>
<td>180 h</td>
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<td>Verwendbarkeit des Moduls</td>
<td>Master's Programme Molecular Biomedicine (Master) &gt; Background Modules</td>
</tr>
<tr>
<td>Zuständige Personen</td>
<td>Bräuer, Anja (module responsibility)</td>
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<tr>
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<td>Bräuer, Anja (Prüfungsberechtigt)</td>
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<td></td>
<td>Maier, Esther Christine (Prüfungsberechtigt)</td>
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<tr>
<td></td>
<td>Maier, Esther Christine (Module counselling)</td>
</tr>
</tbody>
</table>

#### Prerequisites
Enrolment in Master’s programme Molecular Biomedicine

#### Skills to be acquired in this module
**Goals of the Module:**
Upon successful completion of this module, students know and understand cellular and subcellular structures and their function in the human body.

**Competencies:**
++ deepened biological expertise
++ deepened clinical / pathological expertise,
++ deepened knowledge of biological working methods
++ deepened knowledge of clinical / pathological diagnostics,
+ interdisciplinary thinking,
+ critical and analytical thinking,
+ ability to perform independent biological research
+ ethics and professional behaviour

#### Module contents
The module aims to give students an insight into microscopic functional anatomy. In this module, we will cover aspects of cell compartmentalisation and tissue organisation as the basis for normal function and homeostasis. In addition, we will cover examples of organ organisation and organ function. To introduce students to clinical concepts, and to deepen their understanding of the functional roles of cells and tissues, we will also cover aspects of the pathological basis of disease for selected organs and organelles.

In the accompanying seminar, students will have the chance to work on light and electron microscopic pictures, to practice annotation and identification of cells and tissues. In addition, the students will read and present original literature. This will introduce select aspects of disease, but also introduce research methodology and scientific thinking.

This course is **not** a full histology course, but it serves as an introduction to the topic, recapitulates aspects of cell biology and introduces a few select aspects of pathology. Thus, this module is aimed at students with little experience in cell biology.

#### Literatureempfehlungen
- Molecular Biology of the Cell (Alberts et al., 6th ed.)
- Junqueira’s Basic Histology: Text and Atlas (Mescher, 14th ed.)
- Robbins Basic Pathology  (Kumar et al., 9th ed.)

#### Links
https://uol.de/anatomie/forschung/

#### Language of instruction
English

#### Duration (semesters)
1 Semester

#### Module frequency
summer semester

#### Module capacity
25

#### Reference text
**For your notice:** this course will **NOT** cover microscopic imaging techniques, if you are interested please see module gsw200_Microscopic Imaging in Biomedical Sciences.

#### Modullevel / module level
MM (Mastermodul / Master module)

#### Modulart / typ of module
Wahlpflicht / Elective

#### Lehr-/Lernform / Teaching/Learning method
Lecture and Seminar

#### Vorkenntnisse / Previous knowledge
Basic knowledge in biology, chemistry, mathematics

#### Examination
**Prüfungszeiten**

**Type of examination**
written examination (45 min.)
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Biophysical Chemistry

**Module label**
Biophysical Chemistry

**Modulkürzel**
gsw030

**Credit points**
6.0 KP

**Workload**
180 h

**Verwendbarkeit des Moduls**
- Master's Programme Molecular Biomedicine (Master) > Background Modules

**Zuständige Personen**
- Winklhofer, Michael (module responsibility)
- Winklhofer, Michael (Prüfungsberechtigt)

**Prerequisites**
Enrolment in Master’s programme Molecular Biomedicine

**Skills to be acquired in this module**

**Goals of the Module:**
Upon successful completion of this module, students understand physical principles underlying biochemistry and cell biology.

**Competencies:**
- ++ deepened biological expertise
- + data analysis skills
- + usage of databases and computational tools
- + interdisciplinary thinking
- ++ critical and analytical thinking
- ++ data presentation and discussion

**Module contents**
The module focuses on molecular biophysics, biophysical chemistry, biochemistry, cell biology.

Dynamics of single molecules, molecular thermodynamics, statistical thermodynamics; diffusion; chemical equilibria involving macromolecules, signal amplification; spectroscopical techniques (molecular vibration and rotation spectroscopy, electronic absorption and fluorescence spectroscopy, FRET, NMR, Atomic force microscopy).

**Literaturempfehlungen**
- Principles of Biophysical Chemistry (van Holde et al., Pearson/Prentice Hall)
- Physical chemistry (Atkins, Wiley VCH)
- Biophysics - Searching for principles (Bialek, Princeton UP)

**Links**
https://uol.de/en/biology/groups-our-research/sensory-biology-of-animals

**Language of instruction**
English

**Duration (semesters)**
1 Semester

**Module frequency**
summer semester

**Module capacity**
20

**Module level / module level**
MM (Mastermodul / Master module)

**Modulart / typ of module**
Wahlpflicht / Elective

**Lehr-/Lernform / Teaching/Learning method**
Lecture and Seminar

**Vorkenntnisse / Previous knowledge**
basic knowledge in biochemistry and physics

**Examination**

<table>
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<tr>
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<th>Type of examination</th>
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<tr>
<td>short tests in seminar (75%) + presentation (25%)</td>
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**Form of instruction**

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<tr>
<td>Seminar</td>
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<td>28</td>
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**Präsenzzeit Modul insgesamt**
56 h
Module: Molecular and Cellular Biology of Hearing and Deafness

- Module label: Molecular and Cellular Biology of Hearing and Deafness
- Modulkürzel: gsw040
- Credit points: 12.0 KP
- Workload: 360 h
- Verwendbarkeit des Moduls: Master’s Programme Molecular Biomedicine (Master) > Background Modules
- Zuständige Personen: Claußen, Maike (Prüfungsberechtigt), Ebbers, Lena (Prüfungsberechtigt), Ebbers, Lena (module responsibility), Claußen, Maike (module responsibility)
- Prerequisites: Enrolment in Master’s programme Molecular Biomedicine
- Skills to be acquired in this module:
  - Competencies:
    - ++ deepened biological expertise
    - ++ deepened knowledge of biological working methods
    - ++ data analysis skills
    - + interdisciplinary thinking
    - ++ critical and analytical thinking
    - ++ independent searching and knowledge of scientific literature
    - + data presentation and discussion (written and spoken)
- Module contents:
  - The module focuses on auditory neuroscience, molecular and cellular neurobiology.
  - Lecture:
    - Development, anatomy and function of the auditory system (cochlea to cortex), classification, molecular causes and inheritance of auditory disorders, investigation of these disorders in animal models, insights into possibilities of treatment/therapy
  - Seminar:
    - The seminar will focus on possibilities of treatment options in the field of auditory rehabilitation. In a flipped classroom, students will shortly present and discuss different approaches.
  - Exercise:
    - Laboratory experiments to study mouse models of deafness/auditory processing disorders
- Literatureempfehlungen:
  - Springer Handbook of Auditory Research Series Vol. 63:
  - Vona, B., Haaf, T. (Eds.), "Genetics of Deafness", 2016, Karger Publishers
- Links:
  - https://uol.de/en/neurogenetics/research/
- Language of instruction: English
- Duration (semesters): 1 Semester
- Module frequency: Second half of the summer semester
- Module capacity: 8
- Reference text:
  - The number of participants for this module is limited to 8. If there are more students registered than places available, lots will be drawn. Students which are enrolled in Master’s programme Molecular Biomedicine will be preferred.
- Modulelevel / module level: MM (Mastermodul / Master module)
- Modulart / type of module: Wahlpflicht / Elective
- Lehr-/Lernform / Teaching/Learning method: Lecture, Seminar and Exercise
- Vorkenntnisse / Previous knowledge:
  - basic knowledge in genetics, molecular biology and cell biology
- Examination: Prüfungszeiten / Type of examination
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<th>Type of examination</th>
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**Präsenzzeit Modul insgesamt** 112 h
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<td><strong>Workload</strong></td>
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<td><strong>Zuständige Personen</strong></td>
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<td><strong>Skills to be acquired in this module</strong></td>
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<tr>
<td><strong>Literaturnempfehlungen</strong></td>
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<td><strong>Duration (semesters)</strong></td>
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<td><strong>Module capacity</strong></td>
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<td><strong>Modulart / typ of module</strong></td>
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<td><strong>Lehr-/Lernform / Teaching/Learning method</strong></td>
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<td><strong>Vorkenntnisse / Previous knowledge</strong></td>
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<tr>
<td><strong>Examination / Prüfungszeiten</strong></td>
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<td><strong>Form of instruction / SWS / Frequency / Workload of compulsory attendance</strong></td>
</tr>
<tr>
<td>Lecture</td>
</tr>
<tr>
<td>Seminar</td>
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<tr>
<td><strong>Präsenzzeit Modul insgesamt</strong></td>
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</table>
neu141 - Visual Neuroscience - Physiology and Anatomy

Module label: Visual Neuroscience - Physiology and Anatomy

Modulkürzel: neu141

Credit points: 12.0 KP

Workload:
- 3 SWS Lecture (VO)
  Total workload 90 h: 30h contact / 60h background literature reading and preparation for sh
- 1 SWS Seminar (SE)
  Total workload 30h: 10h contact / 20h literature reading and preparation of result presentation
- 8 SWS Supervised exercise (UE)
  Total workload 240h: 200h contact / 40h results analysis, writing of short reports for portfolio

Verwendbarkeit des Moduls
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Molecular Biomedicine (Master) > Background Modules
- Master's Programme Neuroscience (Master) > Background Modules

Zuständige Personen
- Greschner, Martin (module responsibility)
- Greschner, Martin (Prüfungsberechtigt)
- Ahlers, Malte (Prüfungsberechtigt)
- Dedek, Karin (Prüfungsberechtigt)
- Dömer, Patrick (Prüfungsberechtigt)

Prerequisites
- Basic knowledge of neurobiology

Skills to be acquired in this module
- ++ Neurosci. knowlg.
- ++ Exp. Methods
- + Independent research
- ++ Scient. Literature
- + Social skills
- + Maths/Stats/Progr.
- ++ Data present./disc.
- + Scientific English
- + Ethics

Upon successful completion of this course, students
- have basic knowledge of electrophysiological techniques used in neuroscience research
- have acquired first practical skills in some electrophysiological techniques
- have acquired basic skills in data analysis
- have knowledge on retinal physiology and anatomy of the visual system
- have basic knowledge of brain structures and their function
- have profound knowledge of the architecture and circuits of the vertebrate retina
- have acquired basic skills in histological techniques (tissue fixation, embedding, sectioning, staining procedures, immunohistochemistry)
- have acquired fundamental skills in microscopy (differential interference contrast microscopy, phase-contrast microscopy, confocal microscopy)

Module contents
- The background module Neurophysiology consists of two weeks of theoretical introduction and two weeks of hands-on lab exercises in patch or extracellular recordings and two weeks of hands-on lab exercises in anatomy.
- The seminars cover the following topics:
  - Visual system
  - Introduction to electrophysiological methods
  - Introduction into methods used in neuranatomy and neurochemistry
  - Introduction into microscopy and image analysis
  - Presentation and discussion of results relating to the literature

Literatureempfehlungen
- Course scripts and mandatory scientific literature discussed in the seminar will be available in Stud.IP.
Background and seminar literature will be available in Stud.IP.

## Links

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<tr>
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<th>English</th>
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<tbody>
<tr>
<td>Duration (semesters)</td>
<td>1 Semester</td>
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<tr>
<td>Module frequency</td>
<td>annually, summer term, first half (full time)</td>
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<td>Module capacity</td>
<td>12 - with Visual Neuroscience: Anatomy (Shared course components with (cannot be credited twice): neu151 BM Visual Neuroscience: Anatomy)</td>
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## Module level / module level

## Modulart / type of module

## Lehr-/Lernform / Teaching/Learning method

## Vorkenntnisse / Previous knowledge

### Examination

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<th>Type of examination</th>
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<td>Final exam of module</td>
<td>during the course (summer semester, first half) In addition, mandatory but ungraded: seminar presentation</td>
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### Form of instruction

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<td>Seminar</td>
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<tr>
<td>Exercises</td>
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<td>2</td>
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**Präsenzzeit Modul insgesamt**

84 h
neu150 - Visual Neuroscience - Anatomy

Module label: Visual Neuroscience - Anatomy
Modulkürzel: neu150
Credit points: 6.0 KP
Workload: 180 h

Verwendbarkeit des Moduls:
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Molecular Biomedicine (Master) > Background Modules
- Master's Programme Neuroscience (Master) > Background Modules

Zuständige Personen:
- Janssen-Bienhold, Ulrike (module responsibility)
- Dedek, Karin (Module counselling)
- Janssen-Bienhold, Ulrike (Prüfungsberechtigt)
- Dedek, Karin (Prüfungsberechtigt)
- Ahlers, Malte (Prüfungsberechtigt)

Prerequisites:
- attendance in pre-meeting

Skills to be acquired in this module:
- Neurosci. knowlg. Expt. methods
- Independent research + Scient. literature
- Social skills
- Interdiscipl. knowlg. Maths/Stats/Progr. + Data present./disc. + Scientific
- English Ethics
- Theory: Improved theoretical and methodological knowledge in neurobiology.
- Discussion of scientific work and presentation of own results.
- Practice: Performing neuroanatomical experiments. Gaining modern
  methodological skills.

Module contents:
- Lecture: 14 h Introduction to current neurobiological approaches and results.
- Seminar: 14 h Discussion of background literature and results of own
  experiments.
- Lab course: 3 weeks, each 24 h neuroanatomical experiments in small groups
  on vertebrate retina and brain.

Literaturempfehlungen:
- Background and seminar literature will be available in Stud.IP

Links:

Language of instruction: English
Duration (semesters): 1 Semester
Module frequency: jährlich
Module capacity: unlimited

Reference text:
Course in the first half of the semester
Regular active participation and presentation(s) within the scope of the seminar
are required to pass the module

Modullevel / module level:

Modulart / typ of module:

Lehr-/Lernform / Teaching/Learning method:

Vorkenntnisse / Previous knowledge:

Examination / Prüfungszeiten / Type of examination:
Final exam of module / summer semester, first half / Portfolio (75 %),report (25 %)

Form of instruction / Comment / SWS / Frequency / Workload of compulsory
attendance
Lecture / 1 / SoSe / 14
Seminar / 1 / SoSe / 14
Practical training / 3 / SoSe / 42
Präsenzzeit Modul insgesamt / 70 h
### neu220 - Neurocognition and Psychopharmacology

<table>
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<td>neu220</td>
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<tr>
<td>Credit points</td>
<td>6.0 KP</td>
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<tr>
<td>Workload</td>
<td>180 h</td>
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</table>

**Workload**

- 3 SWS Lecture (VO) "Intro. to Cognitive Neuroscience" and "Psychopharmacol." Total workload 135h: 45h contact/ 45 background reading/ 45h exam preparation
- 1 SWS Supervised exercise (UE) Total workload 45h: 14h contact/ 31h paper reading

**Verwendbarkeit des Moduls**

- Master's Programme Biology (Master) > Background Modules
- Master's Programme Biology (Master) > Background Modules
- Master's Programme Molecular Biomedicine (Master) > Background Modules
- Master's Programme Neuroscience (Master) > Background Modules

**Zuständige Personen**

- Thiel, Christiane Margarete (module responsibility)
- Thiel, Christiane Margarete (Module counselling)
- Thiel, Christiane Margarete (Prüfungsberechtigt)
- Gießing, Carsten (Prüfungsberechtigt)

**Prerequisites**

**Skills to be acquired in this module**

- ++ Neurosci. knowlg. + Expt. methods Independent research + Scient. literature + Social skills
- ++ Interdiscipl. knowlg. Maths/Stats/Progr. + Data present./disc. + Scientific English Ethics

Upon successful completion of this course, students
- know the fundamentals of neurotransmission
- know the basic neural mechanisms underlying attention, learning, emotion, language and executive functions
- understand the relationship between disturbances in neurotransmitter systems, cognitive functions and psychiatric disease
- know the principles of drug treatment for psychiatric disorders
- have in-depth knowledge in selected areas of these topics
- are able to understand, explain and critically assess neuroscientific approaches in animals and humans
- are able to understand and critically assess published work in the area of cognitive neuroscience

**Module contents**

The lecture "Introduction to Cognitive Neuroscience" gives a short introduction into neuroanatomy and cognitive neuroscience methods and then covers different cognitive functions.

Lecture topics:
- History of cognitive neuroscience
- Methods of cognitive neuroscience
- Attention
- Learning
- Emotion
- Language
- Executive functions.

The supervised exercise either deepens that knowledge by excersises or discussions of recent papers/ talks on the respective topic covered during that week.

The lecture "Psychopharmacology" illustrates the connection between neurotransmitters and behaviour and its links to psychiatric disease. The lecture contains several interactive parts to consolidate and critically evaluate the acquired knowledge.

Lecture topics:
- Introduction to Terms and Definitions in Drug Research
- Dopaminergic and Noradrenergic System
- Cholinergic and Serotonergic System
- GABAergic and Glutamatergic System
- Addiction
- Depression
- Schizophrenia
- Anxiety
- Alzheimer's Disease

**Literaturempfehlungen**

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<table>
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<tbody>
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<td>Vorkenntnisse / Previous knowledge</td>
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<td>Final exam of module</td>
<td>as agreed, usually in the break after the winter term</td>
<td>100% written exam (content of the lectures)</td>
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| Präsenzzeit Modul insgesamt | 56 h |
### gsw230 - Molecular Pharmacology

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<td>Workload</td>
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**Verwendbarkeit des Moduls**
- Master's Programme Molecular Biomedicine (Master) > Background Modules

**Zuständige Personen**
- Rauch, Bernhard (module responsibility)
- Rauch, Bernhard (Prüfungsberechtigt)
- Meyer, Ulrike (Module counselling)

**Prerequisites**
Enrolment in Master’s programme Molecular Biomedicine

**Skills to be acquired in this module**

Goals of the module:
- Knowledge of general pharmacology and its areas of expertise such as pharmacokinetics and pharmacodynamics and their functions.
- Knowledge of which pathophysiological mechanisms diseases are based on and which molecular targets pharmaceuticals act on in order to alleviate diseases.
- Knowledge of basic actions and side effects of important drug groups.
- Understanding of basic parameters of clinical studies and the importance of clinical studies for therapeutic approaches.

Skills to be acquired/competencies:
++ deepened biological expertise
++ deepened clinical expertise
+ deepened knowledge of biological working methods
+ deepened knowledge of clinical diagnostics
+ data analysis skills
+ interdisciplinary thinking
+ critical and analytical thinking
+ independent searching and knowledge of scientific literature
+ data presentation and discussion (written and spoken)
+ teamwork
+ ethics and professional behavior

**Module contents**
- Fundamentals of general pharmacology, its specialist areas such as pharmacokinetics and pharmacodynamics
- Explanation of the pathophysiological mechanisms of diseases and the corresponding molecular drug targets
- Mechanisms of action and side effects of the major drug groups
- Knowledge of basic parameters of clinical studies and understanding of the importance of clinical studies for therapeutic approaches

**Literaturempfehlungen**
- Basic & Clinical Pharmacology (Basic and Clinical Pharmacology), McGraw-Hill Education (2020)
- For German speaking students: Kurzlehrbuch Pharmakologie und Toxikologie, Herdegen, Thieme (2019)

**Links**

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**Modullevel / module level**

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**Vorkenntnisse / Previous knowledge**

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**gsw240 - Basic Immunology in Health and Disease**

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<td>Verwendbarkeit des Moduls</td>
<td>• Master’s Programme Molecular Biomedicine (Master) &gt; Background Modules</td>
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| Zuständige Personen | • Loser, Karin (module responsibility)  
• Loser, Karin (Prüfungsberechtigt)  
• Mykicki, Nadine (Prüfungsberechtigt) |
| Prerequisites | Enrolment in Master’s programme Molecular Biomedicine  
Basic knowledge in primary cell culture, quantitative real-time PCR, flow cytometry or histology would be highly desirable. |
| Skills to be acquired in this module | Goals of this module:  
After completing this module, students are able to perform experimental approaches necessary to investigate selective immunological questions. These will comprise the normal function of the healthy immune system as well as processes leading to immune system dysregulation or immune system dysfunction in several systemic or organ specific diseases.  
Based on the basic knowledge of immunology acquired in the module students will be able to understand and analyze specific scientific problems, plan experimental approaches accordingly, and perform the experiments.  
Skills to be acquired/ competencies:  
++ Deepened biological expertise  
++ Deepened clinical expertise  
++ Deepened knowledge of biological working methods  
+ Deepened knowledge of clinical diagnostics  
++ Data analysis skills  
+ Interdisciplinary thinking  
++ Critical and analytical thinking  
+ Independent searching and knowledge of scientific literature  
+ Ability to perform independent biological research  
++ Data presentation and discussion (written and spoken)  
+ Teamwork  
+ Project and time management |
| Methods: | Key methods learned and implemented in this module include  
- Primary cell culture and cell separation  
- RNA extraction, reverse transcription and quantitative real-time PCR  
- Tissue sectioning, immunohistology and immunofluorescence staining including microscopy  
- Multicolor flow cytometry  
- Quantification of soluble factors and inflammatory mediators using multiplex-assay techniques |
| Module contents | Lecture:  
- Regulation of innate and adaptive immune responses in healthy individuals  
- Dysregulation of the immune system in inflammatory diseases, cancer or autoimmunity  
- Impact of the environment on immune regulation  
Seminar:  
- Presentation and discussion of laboratory methods used in the practical part  
Exercise:  
This module involves working on small research projects in groups of 2-3 students. The projects include basic immunology in humans and mice with the goal of better understanding the development of allergy, sterile inflammation or autoimmunity as well as immune regulation during cancer or infection. Using the knowledge of immune regulation gained in the lecture and seminar, students will analyze and evaluate specific scientific problems. Required methods of immunology, cell and molecular biology (e.g., flow cytometry, cell separation, isolation and culture of primary immune cells, gene expression studies, histology) are taught and used. |
<p>| Literatureempfehlungen | Text books of Immunology including Janeway’s <em>Immunobiology</em> or Abbas et al. <em>Molecular and Cellular Immunology</em> |
| Links | |
| Language of instruction | English |</p>
<table>
<thead>
<tr>
<th><strong>Duration (semesters)</strong></th>
<th>1 Semester</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Module frequency</strong></td>
<td>winter term</td>
</tr>
<tr>
<td><strong>Module capacity</strong></td>
<td>6 (Due to restrictions in space and limitations in equipment availability the number of participants for this module has to be limited. Students have to be enrolled in the Master's program Molecular Biomedicine.)</td>
</tr>
<tr>
<td><strong>Reference text</strong></td>
<td>High priority is given to students of the Master’s program Molecular Biomedicine. In exceptional cases, vacancies may be allocated to Biology students. However, allocation to students not enrolled in the Master’s program Molecular Biomedicine can only be made by the lecturer(s) responsible for this module (personal application required).</td>
</tr>
</tbody>
</table>

**Modulelevel / module level**

**Modulart / typ of module**

**Lehr-/Lernform / Teaching/Learning method**

**Vorkenntnisse / Previous knowledge**

<table>
<thead>
<tr>
<th>Examination</th>
<th>Prüfungszeiten</th>
<th>Type of examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final exam of module</td>
<td>After the end of the module.</td>
<td>50% presentation, 50% protocol</td>
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</table>

**Form of instruction**

<table>
<thead>
<tr>
<th>SWS</th>
<th>Seminar und Übung</th>
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<tr>
<td>4</td>
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</table>

**Frequency**

<table>
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<tr>
<th>Winterterm (WiSe)</th>
</tr>
</thead>
<tbody>
<tr>
<td>WISe</td>
</tr>
</tbody>
</table>

**Workload Präsenzzeit**

| 56 h |
gsw250 - Molecular Microbiology

Module label: Molecular Microbiology
Modulkürzel: gsw250
Credit points: 6.0 KP
Workload: 180 h

Verwendbarkeit des Moduls:
- Master's Programme Molecular Biomedicine (Master) > Background Modules

Zuständige Personen:
- Noster, Janina (module responsibility)
- Noster, Janina (Prüfungsberechtigt)

Prerequisites:
Enrolment in Master’s programme Molecular Biomedicine

Skills to be acquired in this module:
Goals of this module:
Upon completion of this module the students will have a basic knowledge about bacteriology, antibiotic resistances and gene mutagenesis methods.

Skills to be acquired/ competencies:
++ deepened biological expertise
++ deepened knowledge of biological working methods
+ deepened knowledge of clinical diagnostics
+ data analysis skills
++ interdisciplinary thinking
++ critical and analytical thinking
++ independent searching and knowledge of scientific literature
++ data presentation and discussion (written and spoken)
+ teamwork + ethics and professional behavior
++ project and time management

Module contents:
Lecture:
In the first lectures, basic knowledge of general and specific bacteriology is taught. Subsequently, antibiotic resistance as well as resistance mechanisms are explained in more detail. Finally, the topic of horizontal gene transfer and mobile genetic elements will be discussed.

Seminar:
The seminar will address the topic of antibiotic resistances. Students gain initial experience in formulating a scientific question and designing experiments to answer it. Different cloning strategies are discussed in detail.

Practical course:
The methods developed in the seminar will be put into practice. Antibiotic resistance plasmids will be modified using various techniques and the effects of these manipulations on bacterial physiology and resistance patterns will be investigated.

Literaturempfehlungen:
Textbooks of microbiology. Current literature on antibiotic resistances and horizontal gene transfer will be announced in the lecture.

Links:
Language of instruction: English
Duration (semesters): 1 Semester
Module frequency: winter term
Module capacity: 6 (participation at lectures is not restricted)

Reference text:
The lecture is held weekly during the semester (first half). Seminar and practical course form a joint block course.

Modullevel / module level:
Modulart / type of module:
Lehr-/Lernform / Teaching/Learning method:
Vorkenntnisse / Previous knowledge:

Examination:
Prüfungszeiten: Type of examination
Final exam of module:
written examination: end of the module, presentation: during the seminar/practical course joint block, protocol: end of the practical course
graded: written examination, ungraded: presentation, protocols

Form of instruction:
Comment: SWS
Frequency: Workload of compulsory attendance

24 / 66
<table>
<thead>
<tr>
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<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload of compulsory attendance</th>
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<tr>
<td>Lecture</td>
<td></td>
<td>1</td>
<td>WiSe 14</td>
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<tr>
<td>Seminar und Übung</td>
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<td>3</td>
<td>WiSe 42</td>
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<td></td>
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<td><strong>56 h</strong></td>
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</table>
gsw260 - Molecular Virology

Module label: Molecular Virology
Modulkürzel: gsw260
Credit points: 6.0 KP
Workload: 180 h

Verwendbarkeit des Moduls: Master's Programme Molecular Biomedicine (Master) > Background Modules

Zuständige Personen: Kinast, Volker (module responsibility)
Kinast, Volker (Prüfungsberechtigt)

Prerequisites

Goals of this module:
- upon completion of this module, students
  - know about general aspects of virology including the viral replication cycle, classification of viruses, virus-host-interactions, innate immune response and mechanisms of antiviral therapies
  - know safety aspects of working in a S2 laboratory and working with infectious agents
  - are able to understand, explain and evaluate fundamental concepts and research results in the field of virology

Skills to be acquired/ competencies:
++ comprehensive understanding of the fundamentals of virology
++ knowledge of virological working methods
+ data analysis skills
++ critical and analytical thinking
+ independent searching and knowledge of scientific literature
++ data presentation and discussion (written and spoken)
+ teamwork
+ ethics and professional behavior

Module contents

Lecture:
Fundamentals of virology

Seminar:
Discussion of selected aspects and methods of virology based on original/current literature

Exercises:
cell culture, viral replication assays, luminescence assays, microscopy, data analysis and interpretation

Literature empfehlungen

Literature will be provided during the lecture/seminar

Links

Language of instruction: English
Duration (semesters): 1 Semester
Module frequency: summer term
Module capacity: 16

Modullevel / module level

Modulart / type of module

Lehr-/Lernform / Teaching/Learning method

Vorkenntnisse / Previous knowledge

Examination
Prüfungszeiten
Type of examination

Final exam of module
at the end of the course
graded: written examination, ungraded: presentation (seminar), protocol (exercise)

Form of instruction
Comment
SWS
Frequency
Workload of compulsory attendance

Lecture
1
SoSe
14

Seminar und Übung
3
SoSe
42

Präsenzzeit Modul insgesamt
56 h
bio845 - Introduction to Development and Evolution

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<tbody>
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<td>bio845</td>
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<tr>
<td>Credit points</td>
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<tr>
<td>Workload</td>
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<tr>
<td>Verwendbarkeit des Moduls</td>
<td>- Master's Programme Biology (Master) &gt; Background Modules</td>
</tr>
<tr>
<td></td>
<td>- Master's Programme Molecular Biomedicine (Master) &gt; Background Modules</td>
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<tr>
<td></td>
<td>- Master's Programme Neuroscience (Master) &gt; Background Modules</td>
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<tr>
<td>Zuständige Personen</td>
<td>- Sienknecht, Ulrike (module responsibility)</td>
</tr>
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<td></td>
<td>- Sienknecht, Ulrike (Module counselling)</td>
</tr>
<tr>
<td></td>
<td>- Sienknecht, Ulrike (Prüfungsberechtigt)</td>
</tr>
<tr>
<td></td>
<td>- Claußen, Maike (Prüfungsberechtigt)</td>
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</table>

Prerequisites

Skills to be acquired in this module

Upon successful completion of this course, students
- know the fundamental problems organisms share in development
- know the common basic steps of ontogenesis after comparing the life cycles of different species (both vertebrates and invertebrates)
- know the fundamentals of the genetic control of cell-fate specification, morphogenesis, and organogenesis
- know the principles of gene regulatory networks in development and are able to explain examples
- are able to explain and discuss mechanisms of development across taxonomic groups and questions about the evolution of developmental mechanisms
- have in-depth knowledge of the development of animal nervous systems, including cellular and network properties

skills:
++ deepened biological expertise
+ deepened knowledge of biological working methods
++ interdisciplinary thinking
++ critical and analytical thinking
+ independent searching and knowledge of scientific literature
+ ability to perform independent biological research
+ teamwork

Module contents

Lectures on the fundamentals and concepts of developmental biology, including evolutionary aspects. Parallel seminars matching the topics of the lectures and emphasizing discussion. Lecture topics:
- Introduction to Developmental Biology
- Cell-Cell Communication
- Differential Gene Expression (I and II)
- Early Development of Vertebrates, Gastrulation
- Neurulation
- Brain Development
- Axonal Growth, Target Selection, Synaptogenesis and Refinement
- Neural Crest
- Mesoderm Development
- Morphogenesis
- Developmental Mechanisms of Evolutionary Change
- Model Organisms in Developmental Biology
- Transgenic Mice
- Medical Implications of Developmental Biology

**Literatureempfehlungen**

Literature:

*textbook:* Gilbert S.F.: Developmental Biology, Macmillan Publishers Ltd, 11th edition 2016 (current edition); and current literature on course topics

**Links**

<table>
<thead>
<tr>
<th>Language of instruction</th>
<th>English</th>
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<tbody>
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<tr>
<td>Module frequency</td>
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<td>Module capacity</td>
<td>20 (selection criteria: sequence of registration)</td>
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<tr>
<td>Reference text</td>
<td>associated with bio846 (neu120) (Lab Exercises in Development and Evolution)</td>
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<td>MM (Mastermodul / Master module)</td>
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<td>Modularart / typ of module</td>
<td>Wahlpflicht / Elective</td>
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**Vorkenntnisse / Previous knowledge**

organismic biology, developmental biology, evolutionary biology, neurobiology, genetics, molecular biology

**Examination**

<table>
<thead>
<tr>
<th>Final exam of module</th>
<th>Prüfungszeiten</th>
<th>Type of examination</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>same winter term</td>
<td>oral exam of 30 minutes (or written exam)</td>
</tr>
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**Form of instruction**

<table>
<thead>
<tr>
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<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload of compulsory attendance</th>
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<tbody>
<tr>
<td>Lecture</td>
<td>3</td>
<td>WiSe</td>
<td>45</td>
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<tr>
<td>Seminar</td>
<td>3</td>
<td>WiSe</td>
<td>45</td>
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**Präsenzzeit Modul insgesamt**

90 h
gsw231 - Molecular Pharmacology and Toxicology

**Module label**
Molecular Pharmacology and Toxicology

**Modulkürzel**
gsw231

**Credit points**
6.0 KP

**Workload**
180 h

**Verwendbarkeit des Moduls**
- Master's Programme Molecular Biomedicine (Master) > Background Modules

**Zuständige Personen**
-Rauch, Bernhard (module responsibility)
- Rauch, Bernhard (Prüfungsberechtigt)
- Meyer, Ulrike (Module counselling)

**Prerequisites**
Enrolment in the Master’s programme „Molecular Biomedicie“
Enrolment in the Bachelors’s programme „Chemie“

**Skills to be acquired in this module**
Upon completion of this module, students
- know about the subject of pharmacology in general, its areas of expertise such as pharmacokinetics and pharmacodynamics and their functions.
- understand on which pathophysiological mechanisms diseases are based and on which molecular targets pharmaceuticals act in order to alleviate diseases.
- know the basic actions and side effects of important drug groups.
- understand basic parameters of clinical studies and the importance of clinical studies for therapeutic approaches.

Skills to be acquired/ competencies:
++ deepened biological expertise
++ deepened clinical expertise
+ interdisciplinary thinking
+ critical and analytical thinking
+ independent searching and knowledge of scientific literature
+ data presentation and discussion (written and spoken)
+ ethics and professional behavior
+ basic knowledge of physiology and biochemistry is required

**Module contents**
- Fundamentals of general pharmacology, its specialist areas such as pharmacokinetics and pharmacodynamics
- Explanation of the pathophysiological mechanisms of diseases and the corresponding molecular drugs targets
- Mechanisms of action and side effects of the major drug groups Mechanisms of action and toxins
- Mechanisms of action of common toxins and antidotes
- Knowledge of basic parameters of clinical studies and understanding of the importance of clinical studies for therapeutic approaches

**Literaturempfehlungen**
Basic & Clinical Pharmacology (Basic and Clinical Pharmacology), McGraw-Hill Education (2020)
For German speaking students: Kurzlehrbuch Pharmakologie und Toxikologie, Herdegen,Thieme (2019)

**Links**

**Language of instruction**
English

**Duration (semesters)**
1 Semester

**Module frequency**

**Module capacity**
40

**Module level / module level**

**Lehr-/Lernform / Teaching/Learning method**

**Vorkenntnisse / Previous knowledge**

**Examination**
Prüfungszeiten

**Type of examination**
Klausur oder mündl. Prüfung

**Form of instruction**
Lecture

**SWS**
4

**Frequency**
SoSe oder WiSe
| Workload Präsenzzeit | 56 h (4 SWS) |
gs235 - Practical Molecular Pharmacology

<table>
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<th>Module label</th>
<th>Practical Molecular Pharmacology</th>
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<tbody>
<tr>
<td>Modulkürzel</td>
<td>gsw235</td>
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<tr>
<td>Credit points</td>
<td>6.0 KP</td>
</tr>
<tr>
<td>Workload</td>
<td>180 h</td>
</tr>
<tr>
<td></td>
<td>{</td>
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<tr>
<td></td>
<td>5 SWS</td>
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<tr>
<td></td>
<td>ca. 70 h (two weeks practical seminar/laboratory exercise)</td>
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Verwendbarkeit des Moduls
- Master’s Programme Molecular Biomedicine (Master) > Background Modules

Zuständige Personen
- Rauch, Bernhard (module responsibility)
- Rauch, Bernhard (Prüfungsberechtigt)
- Meyer, Ulrike (Module counselling)

Prerequisites
Enrolment in Master’s programme admission requirement is attendance of the gsw230 module (“Lecture Molecular Pharmacology”) Places are based on attended module “Lecture Molecular Pharmacology” and given grades. Knowledge of physiology and biochemistry is required.

Skills to be acquired in this module
Upon completion of this module, students
- have fundamental knowledge of good laboratory practice.
- have an in-depth understanding of different working methods in the laboratory.
- understand basic parameters of studies and the importance for basic research and therapeutic approaches.

Skills to be acquired/ competencies:
++ deepened biological expertise
++ deepened clinical expertise
++ deepened knowledge of biological working methods
++ data analysis skills
++ critical and analytical thinking
+ deepened knowledge of clinical diagnostics
+ interdisciplinary thinking
+ independent searching and knowledge of scientific literature
+ data presentation and discussion (written and spoken)
+ teamwork
+ ethics and professional behavior

Module contents
- Fundamentals of experimental pharmacology, common analytical laboratory techniques in this area
- Explanation of the pathophysiological mechanisms of diseases and the corresponding molecular drugs targets
- Specific knowledge on selected current research topic in the field of experimental pharmacology
- Knowledge of basic parameters of clinical studies and understanding of the importance of clinical studies for therapeutic approaches

Literaturempfehlungen
Basic & Clinical Pharmacology (Basic and Clinical Pharmacology), McGraw-Hill Education (2020)
For German speaking students: Kurzlehrbuch Pharmakologie und Toxikologie, Herdegen, Thieme (2019)

Links
Language of instruction
- English

Duration (semesters)
- 1 Semester

Module frequency
Module capacity
8

Modulelevel / module level
Modulart / typ of module

Lehr-/Lernform / Teaching/Learning method

Vorkenntnisse / Previous knowledge
Examination
Prüfungszeiten
Type of examination
Final exam of module
Protokoll
Form of instruction
Comment
SWS
Frequency
Workload of compulsory attendance
<table>
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<tbody>
<tr>
<td>Seminar</td>
<td></td>
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<td>Exercises</td>
<td></td>
<td>2</td>
<td>SoSe oder WiSe</td>
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<td></td>
<td></td>
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</table>
**Module**: Introduction to Human Anatomy  
**Modulkürzel**: gsw270  
**Credit points**: 3.0 KP  
**Workload**: 90 h (2 SWS)

**Verwendbarkeit des Moduls**
- Master's Programme Molecular Biomedicine (Master) > Background Modules

**Zuständige Personen**
- Maier, Esther Christine (module responsibility)
- Maier, Esther Christine (Prüfungsberechtigt)

**Prerequisites**
**Skills to be acquired in this module**
- Competencies: Anatomical knowledge of body structure, Functional anatomical knowledge of the body, Understanding the anatomical basis for specific clinical symptoms, Find and name anatomical structures during virtual dissections and annotations, Group work

**Module contents**
- Description
  - +++ Anatomical knowledge
  - ++ Social skills
  - + Interdisciplinary knowledge
  - + Data present./disc.
  - ++ Scientific English
  - ++ Ethics

  Students should be able to correctly identify the anatomical structures of the body and describe the major anatomical pathways connecting the different parts. They also should acquire an understanding of the functional anatomy. This knowledge is applied to analyse some specific examples of clinical symptoms, to deepen the students understanding of the functional relationships of the body parts. Lectures will be complete by virtual dissection exercises and anatomical seminars.

**Literaturempfehlungen**

**Links**

**Language of instruction**: English

**Duration (semesters)**: 1 Semester

**Module frequency**

**Module capacity**: unlimited

**Modullevel / module level**

**Modularart / typ of module**

**Lehr-/Lernform / Teaching/Learning method**

**Vorkenntnisse / Previous knowledge**

**Examination**
- Final exam of module: Portfolio oder mündl. Prüfung oder Präsentation
- Oral exam or portfolio or presentation will be graded

**Form of instruction**

<table>
<thead>
<tr>
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<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload of compulsory attendance</th>
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<tr>
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<tr>
<td>Seminar</td>
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<td>SoSe oder WiSe</td>
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**Präsenzzeit Modul insgesamt**: 0 h
Clinical Modules

gsw060 - Epigenetics and Gene Regulation

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Modulkürzel</td>
<td>gsw060</td>
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<td>6.0 KP</td>
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<tr>
<td>Workload</td>
<td>180 h</td>
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<td>Verwendbarkeit des Moduls</td>
<td>Master's Programme Molecular Biomedicine (Master) &gt; Clinical Modules</td>
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<tr>
<td>Zuständige Personen</td>
<td>Plösch, Torsten (module responsibility)</td>
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<tr>
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<td>Heep, Axel (module responsibility)</td>
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<td>Plösch, Torsten (Prüfungsberechtigt)</td>
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<td>Heep, Axel (Prüfungsberechtigt)</td>
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<td>Hinz, Cornelia (Prüfungsberechtigt)</td>
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<tr>
<td>Prerequisites</td>
<td>enrolment in Master’s programme Molecular Biomedicine</td>
</tr>
<tr>
<td>Skills to be acquired in this module</td>
<td>Goals of the Module:</td>
</tr>
<tr>
<td></td>
<td>Upon successful completion of this module, students</td>
</tr>
<tr>
<td></td>
<td>- know about epigenetic regulation of gene transcription</td>
</tr>
<tr>
<td></td>
<td>- can determine different epigenetic features</td>
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<tr>
<td></td>
<td>- have a basic understanding of the role of epigenetics in human disease</td>
</tr>
<tr>
<td>Competencies</td>
<td>++ deepened biological expertise</td>
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<tr>
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<td>+ deepened clinical expertise</td>
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<tr>
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<td>++ deepened knowledge of biological working methods</td>
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<td>+ deepened knowledge of clinical diagnostics</td>
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<td>+ data analysis skills</td>
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<td>+ critical and analytical thinking</td>
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<td>+ ability to perform independent biological research</td>
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<td>+ data presentation and discussion (written and spoken)</td>
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<td></td>
<td>+ teamwork</td>
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<tr>
<td>Module contents</td>
<td>Lecture:</td>
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<tr>
<td></td>
<td>- introduction to epigenetics</td>
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<td></td>
<td>- regulation of gene expression</td>
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<td>- developmental epigenetics</td>
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<td>- cancer epigenetics</td>
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<td>- current methods</td>
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<td>- ethics</td>
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<td>Seminar:</td>
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<tr>
<td></td>
<td>- presentation of important historical and current primary literature</td>
</tr>
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<td></td>
<td>- presentation and discussion of lab methods used in the practical part</td>
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<tr>
<td></td>
<td>Exercise:</td>
</tr>
<tr>
<td></td>
<td>- Designing bisulfite PCR strategies for methylated DNA</td>
</tr>
<tr>
<td></td>
<td>- analyses of datasets</td>
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<td></td>
<td>- DNA isolation from cells</td>
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<tr>
<td></td>
<td>- <em>in vitro</em> methylation of DNA</td>
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<td></td>
<td>- methylation-specific restriction analysis (and PCR)</td>
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<td></td>
<td>- methylation-specific bisulfite PCR</td>
</tr>
<tr>
<td></td>
<td>- histone characterization</td>
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Literaturempfehlungen

<table>
<thead>
<tr>
<th>Links</th>
<th><a href="https://uol.de/en/paediatrics/perinatal-neurobiology">https://uol.de/en/paediatrics/perinatal-neurobiology</a></th>
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<td>English</td>
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<tr>
<td>Duration (semesters)</td>
<td>1 Semester</td>
</tr>
<tr>
<td>Module frequency</td>
<td>summer term</td>
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<tr>
<td>Module capacity</td>
<td>12</td>
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<tr>
<td>Reference text</td>
<td>The number of participants for this module is limited to 12. If there are more students registered than places available, lots will be drawn. Students which are enrolled in Master’s programme Molecular Biomedicine will be preferred.</td>
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<tr>
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<td>MM (Mastermodul / Master module)</td>
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<td>Wahlpflicht / Elective</td>
</tr>
<tr>
<td>Lehr-/Lernform / Teaching/Learning method</td>
<td>Lecture, Seminar, Exercises</td>
</tr>
<tr>
<td>Vorkenntnisse / Previous knowledge</td>
<td>basic knowledge in cell and developmental biology, solid knowledge in</td>
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</table>
## genetics

<table>
<thead>
<tr>
<th>Examination</th>
<th>Prüfungszeiten</th>
<th>Type of examination</th>
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<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload of compulsory attendance</th>
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<td>1</td>
<td>SoSe</td>
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<tr>
<td>Exercises</td>
<td></td>
<td>2</td>
<td>SoSe</td>
<td>28</td>
</tr>
</tbody>
</table>

**Präsenzzeit Modul insgesamt** 56 h
# Module: Gene-based Therapies in Human diseases

## Module label
Gene-based Therapies in Human diseases

## Modulkürzel
gsw070

## Credit points
6.0 KP

## Workload
180 h

## Verwendbarkeit des Moduls
- Master's Programme Molecular Biomedicine (Master) > Clinical Modules

## Zuständige Personen
- Neidhardt, John (module responsibility)
- Neidhardt, John (Prüfungsberechtigt)
- Jüschke, Christoph (Prüfungsberechtigt)

## Prerequisites
Enrolment in Master’s programme Molecular Biomedicine

## Skills to be acquired in this module
Competencies:
- ++ deepened biological expertise
- ++ deepened clinical expertise
- ++ deepened knowledge of biological working methods
- + deepened knowledge of clinical diagnostics
- + data analysis skills
- + interdisciplinary thinking
- ++ critical and analytical thinking
- + independent searching and knowledge of scientific literature
- ++ ability to perform independent biological research
- + data presentation and discussion (written and spoken)
- + team work
- + project and time management

Adressing students with emphasis on translational/therapeutical interest in molecular biology, molecular genetics, cell biology and neurobiology.

## Module contents
The module focuses on translational research in human genetics, molecular biology, molecular genetics, translational medicine, cell- and neurobiology.

Subjects of the lecture: Therapeutic strategies and research applications, molecular bases of neurodegenerative diseases, structure and function of DNA/RNA/proteins/membranes.

Lecture: To improve knowledge in molecular genetics, molecular biology and cell biology in correlation with human diseases, gain knowledge in Antisense-Oligonucleotide-, U1- and CRISPR-based genetic therapies, viruses in gene therapy, cell sorting and diagnosis by FACS.

Exercises: Learning current methods of therapy development; molecular biology and human genetics; high throughput technologies; introduction to cell cultivation techniques.

Learn to transfer the theoretical knowledge to experiments. Gaining methodological knowledge in molecular genetics, cell biology and therapeutic approaches. Initial training on how to perform research projects.

## Literaturempfehlungen
- Molecular Biology of the Cell (Alberts et al., 6th edition)

## Links
- [https://uol.de/humangenetik/research-and-clinical-collaborations/](https://uol.de/humangenetik/research-and-clinical-collaborations/)

## Language of instruction
English

## Duration (semesters)
1 Semester

## Module frequency
summer semester

## Module capacity
15

## Modullevel / module level
MM (Mastermodul / Master module)

## Modulart / typ of module
Wahlpflicht / Elective

## Lehr-/Lernform / Teaching/Learning method
Lecture and Exercise

## Vorkenntnisse / Previous knowledge
basic knowledge of cell biology, genetics

## Examination
- **Final exam of module**: Prüfungszeiten
  - written examination (90 min.)
  - additionally ungraded: signed lab protocols and regular active participation is required for the module to be passed

## Form of instruction
- Comment
- SWS
- Frequency
- Workload of compulsory attendance

---

36 / 66
<table>
<thead>
<tr>
<th>Form of instruction</th>
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<th>SWS</th>
<th>Frequency</th>
<th>Workload of compulsory attendance</th>
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<td>SoSe</td>
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<td>Exercises</td>
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<td>56 h</td>
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**gs080 - Genetic Diagnostics: from chromosomal aberrations to gene mutations**

<table>
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<th>Genetic Diagnostics: from chromosomal aberrations to gene mutations</th>
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<td>Credit points</td>
<td>6.0 KP</td>
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<tr>
<td>Workload</td>
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</table>

**Verwendbarkeit des Moduls**
- Master’s Programme Molecular Biomedicine (Master) > Clinical Modules

**Zuständige Personen**
- Owczarek-Lipska, Marta (module responsibility)
- Owczarek-Lipska, Marta (Prüfungsberechtigt)

**Prerequisites**
Enrolment in Master’s programme Molecular Biomedicine

**Skills to be acquired in this module**

**Goals of the Module:**
to expand the knowledge about classical cytogenetics and molecular genetics as well as modern cyto- and molecular genetics technics applied in clinical diagnostics and research.

**Competencies:**
++ deepened biological and clinical expertise (cytogenetics and molecular genetics)
++ deepened knowledge of biological working methods and clinical diagnostics (classical cyto- and molecular genetics laboratory methods)
++ data analysis skills
+ interdisciplinary thinking
++ critical and analytical thinking
+ independent searching and knowledge of scientific literature
++ ability to perform independent biological research
+ data presentation and discussion (written and spoken)
+ team work
+ project and time management

**Module contents**
The module focuses on genome- and gene mutations, cyto- and molecular genetics, human syndromes and diseases caused by different chromosomal aberrations.

**Lecture:**
- essentials of classical cytogenetics and molecular genetics, classification of mutations, genetics syndromes/diseases, introduction to the genetic diagnostic laboratory techniques

**Exercises:**
- chromosomal stainings, microscopy, karyotyping, identification of chromosomal aberrations, identification of gene mutations

**Literaturempfehlungen**
Principles of Clinical Cytogenetics by Steven L. Gersen, Martha B. Keagle

**Links**
https://uol.de/genetik-gehirnfehlbildungen/forschungsschwerpunkte/

**Language of instruction**
English

**Duration (semesters)**
1 Semester

**Module frequency**
Second half of the winter semester

**Module capacity**
10

**Reference text**
The number of participants for the practical part of this module is limited to 10. If there are more students registered than places available, lots will be drawn. Students which are enrolled in Master’s programme Molecular Biomedicine will be preferred.

**Modullevel / module level**
MM (Mastermodul / Master module)

**Modulart / typ of module**
Wahlpflicht / Elective

**Lehr-/Lernform / Teaching/Learning method**
Lecture, Seminar and Exercise

**Vorkenntnisse / Previous knowledge**
basic knowledge of genetics and cell biology

**Examination**
Prüfungszeiten
- written examination (90 min., 70%), presentation (30%)
- additionally ungraded: signed lab protocols

**Form of instruction**
Comment | SWS | Frequency | Workload of compulsory attendance
--- | --- | --- | ---
Lecture | 1 | WiSe | 14
Seminar | 1 | WiSe | 14
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<tr>
<td>Exercises</td>
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<td>2</td>
<td>WiSe</td>
<td>28</td>
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<tr>
<td><strong>Präsenzzzeit Modul insgesamt</strong></td>
<td></td>
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</table>
gsw090 - Current Topics in Clinical Research

Module label: Current Topics in Clinical Research

Modulkürzel: gsw090

Credit points: 6.0 KP

Workload: 180 h

Verwendbarkeit des Moduls: Master's Programme Molecular Biomedicine (Master) > Clinical Modules

Zuständige Personen:
- Dömer, Patrick (module responsibility)
- Dömer, Patrick (Prüfungsberechtigt)
- Heep, Axel (Prüfungsberechtigt)
- Lüscher, Torsten (Prüfungsberechtigt)
- Loser, Karin (Prüfungsberechtigt)
- Hinz, Cornelia (Prüfungsberechtigt)
- Dübel, Lena (Prüfungsberechtigt)
- Hamprecht, Axel (Prüfungsberechtigt)
- Noster, Janina (Prüfungsberechtigt)
- Rauch, Bernhard (Prüfungsberechtigt)
- Meyer, Helge (Prüfungsberechtigt)
- Helgers, Simeon (Prüfungsberechtigt)

Prerequisites: Enrolment in Master’s programme Molecular Biomedicine

Skills to be acquired in this module:

Goals of the Module:
Upon successful completion of this module, students
- are familiar with the basic epigenetic mechanisms
- know the principles of different sequencing techniques, both for genetic and epigenetic research
- are familiar with the “first 1000 days of life concept” and how the early environment influences long term health
- know how the human body is colonized
- know about the basic mechanisms involved in CNV development during fetal and early postnatal life
- know about the methods used to study molecular intercellular signaling
- know about the non-invasive methods used to study functional brain development
- know about the insults leading to cerebral ischemia
- know about the mechanism of the neurovascular response
- know about the cellular and electrophysiological effects of acute and chronic cerebral ischemia
- know about the cell types, cellular interactions and molecular changes during peripheral nerve; degeneration and regeneration following nerve trauma
- are able to explain some oncogenic mechanisms of viruses
- can explain preeclampsia and its immunological regulation
- are familiar with antibiotic classes, mode of actions of antibiotics, principles of antibiotic resistance, dissemination of current plasmids causing multi-resistance
- know about differences between susceptibility, tolerance, resistance and persistence to antibiotics, the methods to determine minimal inhibitory concentrations, the causes of persistent infections, the characteristics of persister cells and mechanisms of persister cell formation, and current medical treatment strategies
- are able to explain the concept of cancer immunosurveillance and immunoediting
- can explain current strategies in immunotherapy of cancer including checkpoint inhibition, CAR T cell therapy and cancer vaccination
- are able to explain the mechanisms underlying therapy resistance in malignant diseases, particularly cancers of the gastrointestinal tract and the hepatico-pancreatico-biliary system
- can explain current strategies in cancer diagnostic, particularly liquid biopsy

Competencies:
++ deepened clinical expertise
++ deepened knowledge of biological working methods and clinical diagnostics
++ interdisciplinary thinking
+ data analysis skills
++ critical and analytical thinking
+ independent searching and knowledge of scientific literature
+ ethics and professional behavior

Module contents:
The module focuses on molecular aspects as part of current clinical research in different fields.

Lectures:
(Part 1)
- Genetic and epigenetic sequencing technology
- Epigenetic programming by early life events
- The human microbiome and colonization of the human body
- Molecular insights into functional brain development
- Basic mechanisms involved in CNS development during fetal and early postnatal life
- Introduction to methods used to study molecular signaling
- Introduction to non-invasive methods used to study functional brain development

(Part 2)
- Contribution of the immune system to the progression of infection, autoimmunity, cancer or (neuro-) inflammation
- Modulation of the immune system as a potential therapeutic option
- Interaction of the microbiome with the immune system and impact of environmental factors on the development of immune-mediated diseases

(Part 3)
- Oncogenic potential of viruses (e.g. Cervix carcinoma caused by HPV viruses)
- Molecular insights into carcinogenesis
- Preeclampsia and its immunological regulation

(Part 4)
- Concept of cancer immunosurveillance and immunoediting
- Current strategies for cancer immunotherapy
- Mechanisms of cancer therapy resistance
- Current strategies for cancer diagnosis and liquid biopsy

(Part 5)
- Insights into antibiotic resistance (mode of antibiotics, principles of antibiotic resistance)
- Emergence of multi-resistance and dissemination of plasmids causing multi-resistance
- Differences between susceptibility, tolerance, resistance and persistence of pathogens to antibiotics
- Current hypotheses of inducers for persister cell formation and medical treatment

(Part 6)
- Neurovascular regulation in response to cerebral ischemia
- Molecular and cellular mechanisms of peripheral nerve regeneration

Literaturempfehlungen
Current literature on topics will be provided via Stud.IP

Links

Language of instruction
English

Duration (semesters)
1 Semester

Module frequency
winter semester

Module capacity
25

Modullevel / module level
MM (Mastermodul / Master module)

Modulart / typ of module
Wahlpflicht / Elective

Lehr-/Lernform / Teaching/Learning method
Lecture

Vorkenntnisse / Previous knowledge

<table>
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<th>Examination</th>
<th>Prüfungszeiten</th>
<th>Type of examination</th>
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Form of instruction
Lecture

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<th>Workload Präsenzeit</th>
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<tbody>
<tr>
<td>4</td>
<td>WiSe</td>
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## gsw100 - Immunology and Inflammation

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<td>Modulkürzel</td>
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<td>Credit points</td>
<td>6.0 KP</td>
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<tr>
<td>Workload</td>
<td>180 h</td>
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</table>

### Verwendbarkeit des Moduls
- Master's Programme Molecular Biomedicine (Master) > Clinical Modules

### Zuständige Personen
- Gibbs, Bernhard (Prüfungsberechtigt)
- Gibbs, Bernhard (Module counselling)
- Fakultät 6 Dekanat (module responsibility)

### Prerequisites
- Enrolment in Master’s programme Molecular Biomedicine

### Skills to be acquired in this module
**Competencies:**
- ++ comprehensive understanding of the fundamentals of immunology and inflammation
- ++ deepened knowledge of clinical aspects of diseases
- ++ systematic understanding in the therapy diseases
- + interdisciplinary thinking
- + critical and analytical thinking
- ++ independent searching and knowledge of scientific literature
- ++ data presentation and discussion (written and spoken)
- ++ teamwork
- + time management

### Module contents
- The module focuses on dermatology, immunology and inflammation.

#### Lectures:
- Fundamentals of immunology and inflammation

#### Seminars:
- Worked examples of major inflammatory diseases (e.g. allergies, infections, autoimmune diseases) and advanced therapeutic concepts.

#### Exercises:
- Students will be expected to demonstrate the ability to prepare presentations in small working groups where they critically evaluate current research regarding specific examples of inflammatory diseases and their therapy (problem-orientated learning)

### Literaturempfehlungen
- Textbooks: Janeway's Immunobiology; Authors: Kenneth Murphy, Casey Weaver; 2016 (9th Edition; Garland Science), Cellular and Molecular Immunology; Authors: Abul Abbas, Andrew H. Lichtman, Shiv Pillai; 2017 (9th Edition; Elsevier)

### Links
- https://uol.de/dermatologie/forschung/

### Language of instruction
- English

### Duration (semesters)
- 1 Semester

### Module frequency
- First half of the winter semester

### Module capacity
- 25

### Modulelevel / module level
- MM (Mastermodul / Master module)

### Modular / typ of module
- Wahlpflicht / Elective

### Lehr-/Lernform / Teaching/Learning method
- Lecture, Seminar, Exercise

### Vorkenntnisse / Previous knowledge
- basis knowledge in immunology

### Examination
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<th>Prüfungszeiten</th>
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<tr>
<td>ungraded: formative feedback given for presentations</td>
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### Form of instruction
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<td>Frequency</td>
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<td>WiSe</td>
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<tr>
<td>Präsenzzzeit Modul insgesamt</td>
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### gsw110 - Clinical Aspects of Degenerative Diseases

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**Verwendbarkeit des Moduls**
- Master's Programme Molecular Biomedicine (Master) > Clinical Modules

**Zuständige Personen**
- Zieschang, Tania (module responsibility)
- Dewald, Oliver (module responsibility)
- Zieschang, Tania (Prüfungsberechtigt)
- Koschate, Jessica (Prüfungsberechtigt)
- Mellert, Friedrich (Prüfungsberechtigt)
- Ort, Katharina (Prüfungsberechtigt)
- Hoppe, Florian (Prüfungsberechtigt)

**Prerequisites**
- Enrolment in Master’s programme Molecular Biomedicine

**Skills to be acquired in this module**
- Competencies:
  - ++ comprehensive understanding of clinical manifestation, epidemiology, risk factors, treatment strategies of degenerative diseases
  - ++ understanding of geriatric phenomena
  - ++ understanding and application of the comprehensive geriatric assessment (CGA)
  - ++ interdisciplinary thinking
  - ++ ethics and professional behaviour
  - ++ critical and analytical thinking
  - + independent searching and knowledge of scientific literature
  - ++ data presentation and discussion (written and spoken)
  - ++ teamwork

**Module contents**
The module focuses on geriatric medicine.

**Lecture:**
- fundamentals of degenerative diseases (Alzheimer's disease, Parkinson's disease, Rheumatoid Arthritis, Osteoarthritis, heart valve disease, aortic dilatation) and geriatric phenomena as frailty, multimorbidity and polypharmacy and their impact on diagnostic and treatment options, basics of geriatric medicine, evidence of the impact of the CGA on patient outcomes, dimensions of the CGA, surgical and interventional heart procedures in geriatric patients

**Seminar:**
- instant ageing, the geriatric team, cognitive assessment with actors, work in heart team

**Excursion:**
- small groups (2 students) can accompany clinical rounds on the geriatric ward (either acute geriatric care or geriatric rehabilitation). Conduction of parts of the CGA with patients

**Literaturempfehlungen**
- Textbooks on geriatric medicine and geriatric psychiatry, e.g. Zeyfang et al. Basiswissen Medizin des Alterns und des alten Menschen. Springer.
- Textbooks on cardiac surgery and cardiology, e.g. Ziemer, Haverich: Herzchirurgie.
- Scientific papers related to current research topics will be available in Stud.IP

**Links**
- [https://www.aortenklappenregister.de/publikationen-des-registers.html](https://www.aortenklappenregister.de/publikationen-des-registers.html)

**Language of instruction**
- English

**Duration (semesters)**
- 1 Semester

**Module frequency**
- First half of the winter semester

**Module capacity**
- 20

**Modullevel / module level**
- MM (Mastermodul / Master module)

**Modulart / typ of module**
- Wahlpflicht / Elective

**Lehr-/Lernform / Teaching/Learning method**
- Lecture, Seminar, Excursion

**Vorkenntnisse / Previous knowledge**
- physiology and cardiovascular system

**Examination**

<table>
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<tr>
<th>Prüfungszeiten</th>
<th>Type of examination</th>
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<tbody>
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<td>written examination (60 min, 50%), case presentation (50%)</td>
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**Form of instruction**

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<th>SWS</th>
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<th>Workload of compulsory attendance</th>
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<tbody>
<tr>
<td>Form of instruction</td>
<td>Comment</td>
<td>SWS</td>
<td>Frequency</td>
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<tr>
<td>Exercises</td>
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<td>WiSe</td>
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**Prüfungszeit Modul insgesamt**  
63 h
gsw120 - Tumor Biology

Module label: Tumor Biology
Modulkürzel: gsw120
Credit points: 6.0 KP
Workload: 180 h

Verwendbarkeit des Moduls
- Master's Programme Molecular Biomedicine (Master) > Clinical Modules

Zuständige Personen
- Griesinger, Frank (module responsibility)
- Griesinger, Frank (Prüfungsberechtigt)
- Roeper, Julia (Prüfungsberechtigt)
- Dübbel, Lena (Prüfungsberechtigt)
- Loser, Karin (Prüfungsberechtigt)
- Mykicki, Nadine (Prüfungsberechtigt)
- Dübbel, Lena (Module counselling)
- Roeper, Julia (Module counselling)

Prerequisites
Enrolment in Master’s programme Molecular Biomedicine

Skills to be acquired in this module
Goals of the Module:
Upon successful completion of this module, students
- can define and identify oncogenes and tumor suppressor genes
- know about the hallmarks of cancer and can explain them based on example pathways and traits
- know about the complexity of the tumor tissue and the different cells that are involved
- know about the principles of metastasis.

Competencies:
++ deepened biological & clinical expertise
++ interdisciplinary thinking
+ deepened knowledge of biological working methods & clinical diagnostics
++ data analysis skills
+ usage of databases and computational tools
++ critical & analytical thinking
+ independent searching & knowledge of scientific literature
++ data presentation & discussion (written and spoken)
+ teamwork
++ ethics & professional behavior

Module contents
Part 1 - Lecture:
We will give a brief overview of several aspects of tumor biology: Types of mutation, hallmarks of cancer, tumor as a tissue, metastasis, oncogenes and tumor suppressor genes, signal transduction and many example pathways that are important for cancer progression. In addition, you will learn about tumor-infiltrating immune cells and new therapy options like tumor-immune therapy.

Part 2 - Seminar:
Students will be expected to demonstrate the ability to prepare presentations in small working groups where they critically evaluate current research regarding specific examples of tumor diseases and their therapy (problem-orientated learning)

Optional:
Lectures from the study programme Human Medicine (winter semester only; will be held in German):
Lecture topics from the human Medicine programme focusses on large tumor entities, therapy strategies, and basics of carcinogenesis and therapeutic implementation. Please note, that these lectures are not part of the curriculum and are therefore not relevant for the examinations.

Literatureempfehlungen
Current literature will be uploaded on Stud.IP. Previous literature research is not necessary.
If you are looking for more information/background: Weinberg; "The Biology of Cancer"; Garland Science

Links
Language of instruction: English
Duration (semesters): 1 Semester
Module frequency: winter and summer semester (seminars during the semester break)
Module capacity: 25

Reference text
The number of participants for this module is limited to 25. If there are more students registered than places available, lots will be drawn. Students which
are enrolled in Master’s programme Molecular Biomedicine will be preferred.

<table>
<thead>
<tr>
<th>Modullevel / module level</th>
<th>MM (Mastermodul / Master module)</th>
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<tbody>
<tr>
<td>Modulart / typ of module</td>
<td>Wahlpflicht / Elective</td>
</tr>
<tr>
<td>Lehr-/Lernform / Teaching/Learning method</td>
<td>Basic knowledge of genetics, cell biology and biochemistry</td>
</tr>
<tr>
<td>Vorkenntnisse / Previous knowledge</td>
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<tr>
<td>Examination</td>
<td>Prüfungszeiten</td>
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<td>Final exam of module</td>
<td>written examination (60 min., 75%), presentation (25%)</td>
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</table>

<table>
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<tr>
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<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload of compulsory attendance</th>
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<tbody>
<tr>
<td>Lecture</td>
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<td>SoSe und WiSe</td>
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<tr>
<td>Seminar</td>
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<td>SoSe und WiSe</td>
<td>28</td>
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</tbody>
</table>

| Präsenzzeit Modul insgesamt | 56 h |
gsw130 - Regenerative Medicine in Ophthalmology

Module label: Regenerative Medicine in Ophthalmology

Modulkürzel: gsw130

Credit points: 6.0 KP

Workload: 180 h

Verwendbarkeit des Moduls:
- Master's Programme Molecular Biomedicine (Master) > Clinical Modules

Zuständige Personen:
- Mertsch, Sonja (module responsibility)
- Mertsch, Sonja (Prüfungsberechtigt)
- Schrader, Stefan (Prüfungsberechtigt)

Prerequisites:
Enrolment in Master’s programme Molecular Biomedicine

Skills to be acquired in this module:
- Competencies:
  ++ comprehensive understanding of the fundamentals of regenerative research
  ++ deepened knowledge of clinical aspects of eye diseases
  ++ deepened knowledge of biological lab methods and clinical diagnostics
  (classical tissue engineering, cell culture and molecular laboratory methods)
  ++ systematic understanding in translational research
  + interdisciplinary thinking
  + critical and analytical thinking
  ++ data analysis and interpretation skills
  ++ data presentation and discussion (written and spoken)
  ++ teamwork

Module contents:
The module focuses on regenerative medicine in ophthalmology.

Lectures:
Fundamentals of ophthalmologic diseases and insights of current ophthalmologic research projects including tissue engineering methods

Exercises:
Practical laboratory work: generation of tissue engineered artificial cornea, preparation of porcine cornea and retina, cultivation of primary corneal stem cells, sample preparation for protein and mRNA, Western Blotting, PCR, Paraffin sectioning, HE-staining

Literaturempfehlungen:
Textbooks of ophthalmology, anatomy, current literature concerning tissue engineering methods in ophthalmology. Primary and secondary literature of the field will be provided and introduced at the first meeting.

Links:
https://uol.de/augenheilkunde

Language of instruction: English

Duration (semesters): 1 Semester

Module frequency: winter semester

Module capacity: 5

Reference text:
The number of participants is limited to 5. Students which are enrolled in Master’s programme Molecular Biomedicine will be preferred.

Modullevel / module level: MM (Mastermodul / Master module)

Modulart / typ of module: Wahlpflicht / Elective

Lehr-/Lernform / Teaching/Learning method: Lecture and Exercise

Vorkenntnisse / Previous knowledge:
basic knowledge of cell culture methods, protein and mRNA isolation methods

Examination:
Type of examination: protocol (30%) and presentation (70%)

Form of instruction:
<table>
<thead>
<tr>
<th>Lecture</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload of compulsory attendance</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
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Exercises:
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<th>SWS</th>
<th>Frequency</th>
<th>Workload of compulsory attendance</th>
</tr>
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<tbody>
<tr>
<td>3</td>
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Präsenzzeit Modul insgesamt: 56 h
## Research Modules

**gsw150 - Research Project Molecular Biomedicine**

<table>
<thead>
<tr>
<th>Module label</th>
<th>Research Project Molecular Biomedicine</th>
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</thead>
<tbody>
<tr>
<td>Modulkürzel</td>
<td>gsw150</td>
</tr>
<tr>
<td>Credit points</td>
<td>15.0 KP</td>
</tr>
<tr>
<td>Workload</td>
<td>450 h</td>
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<tr>
<td>Verwendbarkeit des Moduls</td>
<td>• Master's Programme Molecular Biomedicine (Master) &gt; Research Modules</td>
</tr>
<tr>
<td>Zuständige Personen</td>
<td>• Koch, Karl-Wilhelm (module responsibility)</td>
</tr>
<tr>
<td></td>
<td>• Koch, Karl-Wilhelm (Prüfungsberechtigt)</td>
</tr>
<tr>
<td>Further responsible persons</td>
<td>all teachers of the curriculum (module counselling, authorized examiners)</td>
</tr>
<tr>
<td>Prerequisites</td>
<td>as defined in the admission and examination regulations</td>
</tr>
<tr>
<td>Skills to be acquired in this module</td>
<td>Competencies:</td>
</tr>
</tbody>
</table>

++ deepened biological and / or clinical expertise
++ deepened knowledge of biological working methods and / or clinical diagnostics
++ data analysis skills
+ interdisciplinary thinking
++ critical and analytical thinking
++ independent searching and knowledge of scientific literature
++ ability to perform independent biological research
++ data presentation and discussion (written and spoken)
+ team work
+ ethics and professional behaviour
+ project and time management

## Module contents

**Emphasis on research**

Theory and practice of topics related to issues in molecular biomedicine; independent treatment of an individual project; acquiring an advanced theoretical knowledge in selected fields of the molecular biology of the cell (points of emphasis: genetics, biochemistry, cell biology; topics depending on research groups)

There are several options for the lab projects, for example in the broad categories of:

- https://uol.de/en/neurosciences/
- https://uol.de/en/biochemistry/research/
- https://uol.de/en/neurogenetics/research/
- https://uol.de/en/retina/research/
- https://uol.de/en/humanmedizin/
- https://uol.de/anatomie/forschung/
- https://uol.de/dermatologie/forschung/
- https://uol.de/immologie/aktuelle-forschungsprojekte
- https://uol.de/humangenetik/research-and-clinical-collaborations/
- https://uol.de/genetik-gehirnfehlbildungen/forschungsschwerpunkte/
- https://uol.de/augeheilkunde/forschungsschwerpunkte

## Literatureempfehlungen

Specific literature of the topics indicated above; original papers related to the current research question; will be different for every student and every year.

## Links

- **Language of instruction**: English
- **Duration (semesters)**: 1 Semester
- **Module frequency**: every semester, time is flexible and subject to individual arrangement
- **Module capacity**: unlimited
- **Modullevel / module level**: MM (Mastermodul / Master module)
- **Modulart / typ of module**: Wahlpflicht / Elective
- **Lehr-/Lernform / Teaching/Learning method**: Lecture and Project
- **Vorkenntnisse / Previous knowledge**: basic knowledge of cell biology, genetics, biochemistry or clinical biomedicine
- **Examination**

<table>
<thead>
<tr>
<th>Prüfungszeiten</th>
<th>Type of examination</th>
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</thead>
<tbody>
<tr>
<td>graded: project report</td>
<td>ungraded: participation in seminar and 30 min. presentation</td>
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<tr>
<td>Form of instruction</td>
<td>Comment</td>
</tr>
<tr>
<td>-------------------------------------------</td>
<td>--------------------------------</td>
</tr>
<tr>
<td>Seminar</td>
<td></td>
</tr>
<tr>
<td>Project (Individuelles Forschungsprojekt)</td>
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<td><strong>Präsenzzeit Modul insgesamt</strong></td>
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gsw160 - External Research Project Molecular Biomedicine

<table>
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<tbody>
<tr>
<td>Modulkürzel</td>
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<tr>
<td>Workload</td>
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**Verwendbarkeit des Moduls**
- Master's Programme Molecular Biomedicine (Master) > Research Modules

**Zuständige Personen**
- Koch, Karl-Wilhelm (module responsibility)
- Koch, Karl-Wilhelm (Prüfungsberechtigt)

**Further responsible persons**
- all teachers of the curriculum (module counselling, authorized examiners)

**Skills to be acquired in this module**

- Competencies:
  - + deepened biological and / or clinical expertise
  - + deepened knowledge of biological working methods and / or clinical diagnostics
  - ++ data analysis skills
  - + interdisciplinary thinking
  - ++ critical and analytical thinking
  - ++ independent searching and knowledge of scientific literature
  - ++ ability to perform independent biological research
  - ++ data presentation and discussion (written and spoken)
  - + team work
  - + ethics and professional behaviour
  - + project and time management

**Module contents**

- Emphasis on research

  Theory and practice of topics related to issues in molecular biomedicine; independent treatment of an individual project; acquiring an advanced theoretical knowledge in selected fields of the molecular biology of the cell (points of emphasis: genetics, biochemistry, cell biology; topics depending on research groups).

**Literatureempfehlungen**

- Specific literature of the topics indicated above; original papers related to the current research question; will be different for every student and every year.

**Links**

- Language of instruction: English
- Duration (semesters): 1 Semester
- Module frequency: every semester, time is flexible and subject to individual arrangement
- Module capacity: unlimited
- Modullevel / module level: MM (Mastermodul / Master module)
- Modulart / typ of module: Wahlpflicht / Elective
- Lehr-/Lernform / Teaching/Learning method: Seminar and Project

**Vorkenntnisse / Previous knowledge**

- basic knowledge of cell biology, genetics, biochemistry or clinical biomedicine

**Examens**

- Examination: Prüfungszeiten
- Type of examination: graded: project report ungraded: participation in seminar and 30 min. presentation

**Form of instruction**

<table>
<thead>
<tr>
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<th>Comment</th>
<th>SWS</th>
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<td>Seminar</td>
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<td>SoSe oder WiSe</td>
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<tr>
<td>Project (Individuelles Forschungsprojekt)</td>
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<td>SoSe oder WiSe</td>
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**Präsenzzzeit Modul insgesamt**

- 140 h
Skills Modules

gsw170 - Research Techniques Molecular Biomedicine

| Module label | Research Techniques Molecular Biomedicine |
| Modulkürzel | gsw170 |
| Credit points | 6.0 KP |
| Workload | 180 h |

Verwendbarkeit des Moduls
- Master's Programme Molecular Biomedicine (Master) > Skills Modules

Zuständige Personen
- Hartmann, Anna-Maria (module responsibility)
- Hartmann, Anna-Maria (Prüfungsberechtigt)

Prerequisites
- Enrolment in Master's programme Molecular Biomedicine

Skills to be acquired in this module

| Competencies: |
| ++ deepened knowledge of biological working methods |
| ++ deepened knowledge of clinical diagnostics |
| ++ data analysis skills |
| ++ interdisciplinary thinking |
| ++ critical and analytical thinking |
| ++ ability to perform independent biological research |
| ++ data presentation and discussion (written and spoken) |

Basic knowledge of techniques used in molecular biomedicine

Module contents

The module focuses on competence in research methods.

Seminar:
Hybridization and detection of nucleic acid, polymerase chain reaction, nucleic acid sequencing, analyses of epigenetic modifications, protein-nucleic acid Interaction, Immunological techniques, light microscopy techniques, mass spectrometry analyses, protein-protein interactions, fluorescence in situ hybridization

Exercise:
molecular biological techniques (PCR, agarose gel, plasmid preparation, restriction), Immunological methods (cell culturing, cytochemistry), biochemistry techniques (SDS gel, western blotting, protein purification, photometry)

Literaturempfehlungen

Links

Language of instruction
English

Duration (semesters)
1 Semester

Module frequency
Second half of the winter semester; annually

Module capacity
25

Modulart / typ of module
MM (Mastermodul / Master module)

Lehr-/Lernform / Teaching/Learning method
Seminar and Exercise

Vorkenntnisse / Previous knowledge

Form of instruction

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<td>Practical training</td>
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Präsenzzeit Modul insgesamt
56 h
### gsw180 - Ethics in Medicine

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<td>gsw180</td>
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<td>Workload</td>
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**Verwendbarkeit des Moduls**
- Master's Programme Molecular Biomedicine (Master) > Skills Modules

**Zuständige Personen**
- Schweda, Mark (module responsibility)
- Schweda, Mark (Prüfungsberechtigt)
- Weßel, Merle (Prüfungsberechtigt)

**Prerequisites**
- Enrolment in Master’s programme Molecular Biomedicine

**Skills to be acquired in this module**

**Competencies:**
- **++** deepened medical / ethical expertise with a focus on research ethics
- **++** interdisciplinary thinking
- **++** critical and analytical thinking
- **+** independent searching and knowledge of scientific literature
- **+** ability to perform independent biological research
- **++** data presentation and discussion (written and spoken)
- **+** team work
- **++** ethics and professional behaviour
- **+** project and time management

**Module contents**
- Concept of ethics and central theoretical approaches to ethics
- Research ethical standards and their evolution
- Good scientific practice (scientific misconduct, criteria of authorship, documentation of research, IRB approval)
- Central areas of ethically sensitive research (stem cell and embryonic research, genomic research, clinical studies, social research)
- Ethical problems in research (research with incompetent and vulnerable populations)

**Literaturempfehlungen**

**Links**
- [https://uol.de/medizinethik/](https://uol.de/medizinethik/)

**Language of instruction**
- English

**Duration (semesters)**
- 1 Semester

**Module frequency**
- winter semester

**Module capacity**
- 25

**Module / module level**
- MM (Mastermodul / Master module)

**Modulart / typ of module**
- Wahlpflicht / Elective

**Lehr-/Lernform / Teaching/Learning method**
- Lecture

**Vorkenntnisse / Previous knowledge**

**Examination**
- Prüfungszeiten
- Type of examination: essay

**Final exam of module**
- Vorlesung und Seminar

**Form of instruction**
- 2

**SWS**
- WISe

**Workload Präsenzzeit**
- 28 h
## gsw190 - Journal Club

<table>
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<tr>
<th>Module label</th>
<th>Journal Club</th>
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<tbody>
<tr>
<td>Modulkürzel</td>
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<tr>
<td>Workload</td>
<td>90 h</td>
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</table>

### Verwendbarkeit des Moduls
- Master's Programme Molecular Biomedicine (Master) > Skills Modules

### Zuständige Personen
- Mertsch, Sonja (module responsibility)
- Mertsch, Sonja (Prüfungsberechtigt)
- Maier, Esther Christine (Prüfungsberechtigt)
- Schrader, Stefan (Prüfungsberechtigt)

### Further responsible persons
- all teachers of the curriculum

### Prerequisites
- Enrolment in Master’s programme Molecular Biomedicine. Neuroscience and Biology students can participate on request.

### Skills to be acquired in this module
- **Competencies:**
  - ++ reading and understanding of original scientific literature
  - ++ deepened biological expertise
  - ++ deepened knowledge of biological working methods
  - ++ data analysis skills
  - + interdisciplinary thinking
  - ++ critical and analytical thinking
  - ++ independent searching and knowledge of scientific literature
  - + ability to perform independent biological research
  - ++ data presentation and discussion (written and spoken)

### Module contents
- The module focuses on current topics in molecular cell biology and biomedicine.
- Seminar topics: original literature of molecular life science related to health and disease

### Literatureempfehlungen
- publications related to the current research question

### Links
- Language of instruction: English
- Duration (semesters): 1 Semester
- Module frequency: winter and summer semester
- Module capacity: 20
- Modullevel / module level: MM (Mastermodul / Master module)
- Modulart / type of module: Wahlpflicht / Elective
- Lehr-/Lernform / Teaching/Learning method: Seminar

### Vorkenntnisse / Previous knowledge
- basic knowledge of cell biology, genetics, biochemistry

### Examination
- **Prüfungszeiten**
- Type of examination
- Final exam of module
- 2 presentations
- Form of instruction: Seminar
- SWS: 2
- Frequency: SoSe und WiSe
- Workload Präsenzzeit: 28 h
gsw200 - Microscopic Imaging in Biomedical Sciences

<table>
<thead>
<tr>
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<th>Microscopic Imaging in Biomedical Sciences</th>
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</thead>
<tbody>
<tr>
<td>Modulkürzel</td>
<td>gsw200</td>
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<tr>
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<td>Workload</td>
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<tr>
<td>Verwendbarkeit des Moduls</td>
<td>• Master's Programme Molecular Biomedicine (Master) &gt; Skills Modules</td>
</tr>
<tr>
<td></td>
<td>• Master's Programme Neuroscience (Master) &gt; Skills Modules</td>
</tr>
<tr>
<td>Zuständige Personen</td>
<td>• Dedek, Karin (module responsibility)</td>
</tr>
<tr>
<td></td>
<td>• Groß, Petra (Prüfungsberechtigt)</td>
</tr>
<tr>
<td></td>
<td>• Dedek, Karin (Prüfungsberechtigt)</td>
</tr>
<tr>
<td></td>
<td>• Solovyeva, Vita (Prüfungsberechtigt)</td>
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<tr>
<td>Prerequisites</td>
<td>Enrollment in Master's programmes Molecular Biomedicine and Neuroscience.</td>
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<tr>
<td>Skills to be acquired in this module</td>
<td>Competencies:</td>
</tr>
<tr>
<td></td>
<td>+ deepened biological expertise</td>
</tr>
<tr>
<td></td>
<td>++ deepened knowledge of biological working methods</td>
</tr>
<tr>
<td></td>
<td>+ data analysis skills</td>
</tr>
<tr>
<td></td>
<td>++ interdisciplinary thinking</td>
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<tr>
<td></td>
<td>++ critical and analytical thinking</td>
</tr>
<tr>
<td></td>
<td>++ data presentation and discussion (written and spoken)</td>
</tr>
<tr>
<td></td>
<td>+ team work</td>
</tr>
<tr>
<td>Module contents</td>
<td>The module focuses on microscopy, imaging and methods of microscopy.</td>
</tr>
<tr>
<td>Lecture</td>
<td>Basics in optics, microscopy methods, image processing, biomedical applications</td>
</tr>
<tr>
<td>Seminar</td>
<td>Examples for selected microscopy methods and their application. Different microscopical methods and their applications are discussed and compared. Students will understand the basics and limitations of microscopy methods and learn to evaluate them. Selected methods are demonstrated.</td>
</tr>
<tr>
<td>Literatureempfehlungen</td>
<td>Literature will be provided during the lecture/seminar</td>
</tr>
<tr>
<td>Links</td>
<td></td>
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<tr>
<td>Language of instruction</td>
<td>English</td>
</tr>
<tr>
<td>Duration (semesters)</td>
<td>1 Semester</td>
</tr>
<tr>
<td>Module frequency</td>
<td>afternoon event during winter semester</td>
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<td>Module capacity</td>
<td>16 (Selection criteria: attendance at first meeting)</td>
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<td>Modullevel / module level</td>
<td>MM (Mastermodul / Master module)</td>
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<tr>
<td>Modulart / typ of module</td>
<td>Wahlpflicht / Elective</td>
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<tr>
<td>Lehr-/Lernform / Teaching/Learning method</td>
<td>Lecture and Seminar</td>
</tr>
<tr>
<td>Vorkenntnisse / Previous knowledge</td>
<td>basic physics, basic cell biology</td>
</tr>
<tr>
<td>Examination</td>
<td>Prüfungszeiten</td>
</tr>
<tr>
<td></td>
<td>Type of examination</td>
</tr>
<tr>
<td>Final exam of module</td>
<td></td>
</tr>
<tr>
<td>Form of instruction</td>
<td>Comment</td>
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<tr>
<td></td>
<td>SWS / Frequency / Workload of compulsory attendance</td>
</tr>
<tr>
<td>Lecture</td>
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<tr>
<td>Seminar</td>
<td>1 / WiSe / 14</td>
</tr>
<tr>
<td>Präsenzzeit Modul insgesamt</td>
<td>28 h</td>
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Note: to qualify for the exam, regular participation during the semester is mandatory, no more than 2 days of absence.
neu751 - Laboratory Animal Science

Module label: Laboratory Animal Science

Modulkürzel: neu751

Credit points: 3.0 KP

Workload: 90 h

- one week full-time in semester break + flexible time for studying and exam preparation
- 1 SWS Lecture
  - total workload 45h: 2h contact / 20h background reading / 23h exam preparation
- 1 SWS Supervised exercise
  - total workload 45h: 35h contact / 10h background reading

Verwendbarkeit des Moduls

- Master's Programme Biology (Master) > Skills Modules
- Master's Programme Biology (Master) > Skills Modules
- Master's Programme Molecular Biomedicine (Master) > Skills Modules
- Master's Programme Neuroscience (Master) > Skills Modules

Zuständige Personen

- Köppl, Christine (module responsibility)
- Köppl, Christine (Prüfungsberechtigt)
- Langemann, Ulrike (Prüfungsberechtigt)
- Nolte, Arne (Prüfungsberechtigt)
- Heyers, Dominik (Prüfungsberechtigt)
- Ebberts, Lena (Prüfungsberechtigt)
- Dedek, Karin (Prüfungsberechtigt)
- Schmaljohann, Heiko (Prüfungsberechtigt)
- Winklhofer, Michael (Prüfungsberechtigt)

Prerequisites

none

Skills to be acquired in this module

++ Expt. Methods
+ Independent Research
+ Scient. Literature
++ Social skills
++ Interdiscipl. knowlg
+ Scientific English
++ Ethics

Upon successful completion of this course, students

- know the relevant EU legislation governing animal welfare and are able to explain its meaning in common language
- understand and are able to critically discuss salient ethical concepts in animal experimentation, such as the three Rs and humane endpoint
- have basic knowledge of the biology and husbandry of laboratory animal species held at the University of Oldenburg (rodents or birds or fish)
- are able to critically assess the needs and welfare of animals without compromising scientific integrity of the investigation
- have practical skills in handling small rodents or birds or fish
- have profound knowledge of anaesthesia, analgesia and basic principles of surgery.
- have practised invasive procedures and euthanasia.

NOTE: These objectives aim to satisfy the requirements for EU directive A „Persons carrying out animal experiments” and EU directive D „Persons killing animals”.

Module contents

Background knowledge is taught using the third-party online platform "LAS Interactive" which concludes with a written exam that has to be passed before the practical part. Topics covered are:

- Legislation, ethics and the 3Rs
- Scientific integrity
- Data collection *
- Basic biology of rodents, birds and fish
- Husbandry, and nutrition of rodents, birds and fish
- Animal Welfare
- Health monitoring
- Pain and distress
- Euthanasia
Practical procedures will first be demonstrated, important aspects will then be practiced under supervision by every participant, on an animal model of their choice (rodents, birds or fish):

- Handling and external examination
- Administration of substances, blood sampling
- Euthanasia and dissection
- Transcardial perfusion
- Anaesthesia and surgery

<table>
<thead>
<tr>
<th>Literatureempfehlungen</th>
<th>&quot;LAS interactive&quot; internet-based learning platform</th>
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</thead>
<tbody>
<tr>
<td>Links</td>
<td></td>
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<td>Language of instruction</td>
<td>English</td>
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<td>Duration (semesters)</td>
<td>1 Semester</td>
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<td>semester break, every semester</td>
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<td>Modulart / typ of module</td>
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<td>Lehr-/Lernform / Teaching/Learning method</td>
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<td>Vorkenntnisse / Previous knowledge</td>
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<tr>
<td>Examination</td>
<td>Prüfungszeiten Type of examination</td>
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<td>immediately before the practical part written exam of 90 minutes</td>
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Präsenzzeit Modul insgesamt 28 h
neu760 - Scientific English

<table>
<thead>
<tr>
<th>Module label</th>
<th>Scientific English</th>
</tr>
</thead>
<tbody>
<tr>
<td>Modulkürzel</td>
<td>neu760</td>
</tr>
<tr>
<td>Credit points</td>
<td>6.0 KP</td>
</tr>
<tr>
<td>Workload</td>
<td>180 h</td>
</tr>
<tr>
<td></td>
<td>(0,5 SWS Lecture (VO)</td>
</tr>
<tr>
<td></td>
<td>(3,5 SWS Supervised exercise (UE)</td>
</tr>
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</table>

**Verwendbarkeit des Moduls**
- Master's Programme Biology (Master) > Skills Modules
- Master's Programme Molecular Biomedicine (Master) > Skills Modules
- Master's Programme Neuroscience (Master) > Skills Modules

**Zuständige Personen**
- Köppl, Christine (module responsibility)
- Köppl, Christine (Prüfungsberechtigt)

**Prerequisites**
- non-native speakers

**Skills to be acquired in this module**
+ Neurosci. knowlg.
++ Social skills
++ Data present./disc.
++ Scientific English

Upon completion of this course, students
- have increased their proficiency in different forms of scientific presentation and communication in English, with special emphasis on neuroscience
- are able to express themselves with correct sentence structure and grammar, correct use of idioms and correct pronunciation
- are proficient in different contexts of scientific communication (e.g., paper, poster and informal exchange by email or phone)
- are able to recognize and avoid common errors of non-native speakers.

**Module contents**
Lectures cover
- characteristics of the different forms of scientific presentations
- sentence structure using the passive voice
- scientific vocabulary and terminology as contrasted to common speech
- appropriate language for communication with scientific editors and referees

Students read neuroscience texts of an advanced level and practice explaining and presenting these in both written and oral form. They also practice different contexts of scientific communication (e.g., paper, poster and informal exchange by email or phone). Emphasis is placed on individual problems in pronunciation and language use errors.

**Literaturempfehlungen**
http://users.wpi.edu/~nab/sci_eng/ScientificEnglish.pdf

**Language of instruction**
English

**Duration (semesters)**
1 Semester

**Module frequency**
annually, semester break

**Module capacity**
12

**Reference text**
Usually held in the break before summer term
Outsourced to STELS-OL (Scientific and Technical English Language Service); native English speaker with in-depth neuroscience knowlg.

**Modullevel / module level**

**Modulart / typ of module**

**Lehr-/Lernform / Teaching/Learning method**

**Vorkenntnisse / Previous knowledge**
minimum English level B2 (C1 preferred) according to Common European Framework of Reference for Languages (CEFR)
priority to non-native speakers, higher semester

**Examination**
Prüfungszeiten
Type of examination
<table>
<thead>
<tr>
<th>Examination</th>
<th>Prüfungszeiten</th>
<th>Type of examination</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Final exam of module</strong></td>
<td>within 2 months of completing the course</td>
<td>Portfolio: 70% several quick tests, texts, presentations, 30% term paper</td>
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<tr>
<td></td>
<td></td>
<td>Bonus system for active participation</td>
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</table>

<table>
<thead>
<tr>
<th>Form of instruction</th>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload of compulsory attendance</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lecture</td>
<td>0.5</td>
<td></td>
<td>WiSe</td>
<td>7</td>
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<tr>
<td>Exercises</td>
<td>3.5</td>
<td></td>
<td>WiSe</td>
<td>49</td>
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</table>

**Präsenzzeit Modul insgesamt** 56 h
# gsw210 - Scientific Communication

<table>
<thead>
<tr>
<th>Module label</th>
<th>Scientific Communication</th>
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<tbody>
<tr>
<td>Modulkürzel</td>
<td>gsw210</td>
</tr>
<tr>
<td>Credit points</td>
<td>6.0 KP</td>
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<tr>
<td>Workload</td>
<td>180 h</td>
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</tbody>
</table>

### Verwendbarkeit des Moduls
- Master's Programme Molecular Biomedicine (Master) > Skills Modules

### Zuständige Personen
- Plösch, Torsten (module responsibility)
- Plösch, Torsten (Prüfungsberechtigt)
- Gibbs, Bernhard (Prüfungsberechtigt)
- Dömer, Patrick (Prüfungsberechtigt)
- Dittmann, Tim (Prüfungsberechtigt)

### Prerequisites
Enrolment in Master’s programme Molecular Biomedicine

### Skills to be acquired in this module

**Goals of the module:**
Upon completion of this module, students
- have improved their competencies in scientific writing
- demonstrate effective communication and presentation skills (oral and written)
- can defend their findings in scientific discussions or rebuttal letters
- know about major communication pitfalls

**Competencies:**
- ++ scientific writing
- ++ data presentation and discussion
- + independent searching and knowledge of scientific literature
- + teamwork
- + critical and analytical thinking

### Module contents
**Seminar:**
- Introduction to scientific writing (analysis of scientific publications, structure of publications, common mistakes, logical story plots)
- Types of scientific communications: posters, oral presentations, journal papers, grant applications, CV/job application
- Literature management (information search, literature management tools, plagiarism)
- Presentation techniques (how to structure your poster/presentation, how to reach your audience)
- How to write your Master’s thesis
- Job application (CV, application letter)
- How do others perceive your message?
- “don’ts” of scientific communication
- Social media for scientists
- The perfect abstract

**Exercise**
- Analysis of scientific publications
- Writing an abstract
- Presentation (poster, short talk)

### Literatureempfehlungen
A list will be distributed on forehand

### Links
**Language of instruction**
- English

**Duration (semesters)**
- 1 Semester

**Module frequency**
- Winter term

**Module capacity**
- 12

**Reference text**
The number of participants for this module is limited to 12. If there are more students registered than places available, lots will be drawn. Students which are enrolled in Master’s programme Molecular Biomedicine will be preferred.

**Modullevel / module level**
- MM (Mastermodul / Master module)

**Modulart / typ of module**
- Wahlpflicht / Elective

**Lehr-/Lernform / Teaching/Learning method**
- Seminar and Exercise

### Examination

<table>
<thead>
<tr>
<th>Examination</th>
<th>Prüfungszeiten</th>
<th>Type of examination</th>
</tr>
</thead>
<tbody>
<tr>
<td>Final exam of module</td>
<td>during seminar</td>
<td>portfolio (presentation, several exercises, active participation during discussions)</td>
</tr>
<tr>
<td><strong>Form of instruction</strong></td>
<td>Seminar und Übung</td>
<td></td>
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<td>------------------------</td>
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<tr>
<td><strong>SWS</strong></td>
<td>4</td>
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<tr>
<td><strong>Frequency</strong></td>
<td>SoSe oder WiSe</td>
<td></td>
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<tr>
<td><strong>Workload Präsenzzeit</strong></td>
<td>56 h</td>
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**gsw220 - Bioinformatics and Omics**

<table>
<thead>
<tr>
<th>Module label</th>
<th>Bioinformatics and Omics</th>
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<tbody>
<tr>
<td>Modulkürzel</td>
<td>gsw220</td>
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<tr>
<td>Credit points</td>
<td>6.0 KP</td>
</tr>
<tr>
<td>Workload</td>
<td>180 h</td>
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</tbody>
</table>

**Verwendbarkeit des Moduls**
- Master's Programme Molecular Biomedicine (Master) > Skills Modules

**Zuständige Personen**
- Hitz, Marc-Phillip (module responsibility)
- Gieldon, Laura (Prüfungsberechtigt)
- Hitz, Marc-Phillip (Prüfungsberechtigt)
- Audain Martinez, Enrique (Prüfungsberechtigt)

**Skills to be acquired in this module**

**Module contents**

**Literaturrempfehlungen**
- Literature will be provided during the lecture/seminar;
- A list will be distributed on forehand

**Links**

**Languages of instruction**

**Duration (semesters)**
- 1 Semester

**Module frequency**
- Module capacity: 25
- Module level / module level
- Modular / type of module

**Lehr-/Lernform / Teaching/Learning method**

**Vorkenntnisse / Previous knowledge**

**Examination**
- Prüfungszeiten
- Type of examination
- Final exam of module will be announced in class; at the end of the course
- Portfolio (exercises, active participation during discussions)

**Form of instruction**

<table>
<thead>
<tr>
<th>Comment</th>
<th>SWS</th>
<th>Frequency</th>
<th>Workload of compulsory attendance</th>
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</thead>
<tbody>
<tr>
<td>Seminar und Übung</td>
<td>2</td>
<td>--</td>
<td>28</td>
</tr>
<tr>
<td>Lecture</td>
<td>2</td>
<td>--</td>
<td>28</td>
</tr>
</tbody>
</table>

**Präsenzzeit Modul insgesamt**
- 56 h
gsw215 - Introduction to Academic Writing

Module label
Introduction to Academic Writing

Modulkürzel
gsw215

Credit points
3.0 KP

Workload
90 h
- Seminar 1SWS
- Übung 1SWS

Verwendbarkeit des Moduls
- Master’s Programme Molecular Biomedicine (Master) > Skills Modules

Zuständige Personen
- Helgers, Simeon (module responsibility)
- Dömer, Patrick (Prüfungsberechtigt)
- Helgers, Simeon (Prüfungsberechtigt)

Prerequisites
Enrolment in Master’s programme Molecular Biomedicine

Skills to be acquired in this module
Goals of this module:
Upon successful completion of this module, students are familiar with the basic principles of academic practice including academic writing, data analysis, data presentation and general rules regarding ethics and laws.

Skills to be acquired/ competencies:
++ independent searching and knowledge of scientific literature
++ ethics and professional behavior
++ data presentation and discussion (written and spoken)
++ data analysis skills
+ deepened knowledge of biological working methods
+ critical and analytical thinking
+ interdisciplinary thinking
+ teamwork

Module contents
The module focuses on the basic principles of academic practice. In theoretical and practical parts, the students will:
- learn how to structure and write protocols, articles, and thesis.
- be introduced to general guidelines, plagiarism, national and international guidelines and good scientific practice.
- learn how to manage, analyze, and present data sets in written and spoken form.
- learn to work with scientific images/plots etc.
- be introduced to application writing (ethic approvals, grand applications etc.)
- learn about authorship and the process of publications.

The module will consist of lectures and practical parts consisting of lab work, data analysis and writing assignments.

Literaturempfehlungen

Links

Language of instruction
English

Duration (semesters)
1 Semester

Module frequency

Module capacity
25

Modullevel / module level

Modulart / typ of module

Lehr-/Lernform / Teaching/Learning method

Vorkenntnisse / Previous knowledge

Examination
Prüfungszeiten
Type of examination

Final exam of module
PF Portfolio: (presentation, written protocol, active participation) - ungraded

Form of instruction
Comment
SWS
Frequency
Workload of compulsory attendance

Seminar
1
SoSe oder WiSe
0

Exercises
1
SoSe oder WiSe
0

Präsenzzzeit Modul insgesamt
0 h
## Masterabschlussmodul

**mam - Master Thesis Module**

<table>
<thead>
<tr>
<th>Module label</th>
<th>Master Thesis Module</th>
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<tbody>
<tr>
<td>Modulkürzel</td>
<td>mam</td>
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<tr>
<td>Credit points</td>
<td>30.0 KP</td>
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<tr>
<td>Workload</td>
<td>900 h</td>
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<tr>
<td></td>
<td>(attendance in the lab meetings: 28 hours (2 SWS); theses work: 872 hours)</td>
</tr>
<tr>
<td>Verwendbarkeit des Moduls</td>
<td>Master's Programme Molecular Biomedicine (Master) &gt; Masterabschlussmodul</td>
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<tr>
<td>Zuständige Personen</td>
<td>all teachers of the curriculum</td>
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<tr>
<td>Prerequisites</td>
<td>as defined in the admission and examination regulations</td>
</tr>
<tr>
<td>Skills to be acquired in this module</td>
<td>++ deepened biological and / or clinical expertise, ++ deepened knowledge of biological working methods and / or clinical diagnostics, ++ data analysis skills, + interdisciplinary thinking, ++ critical and analytical thinking, ++ independent searching and knowledge of scientific literature, ++ ability to perform independent biological research, ++ data presentation and discussion (written and spoken), + team work, + ethics and professional behaviour, ++ project and time management</td>
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<tr>
<td>Module contents</td>
<td>Preparation of the Master Thesis. There are several options for the lab projects, e.g. in the broad categories of:</td>
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<td><a href="https://uol.de/en/neurosciences/">https://uol.de/en/neurosciences/</a></td>
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<tr>
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<td>o <a href="https://uol.de/en/biochemistry/research/">https://uol.de/en/biochemistry/research/</a></td>
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<tr>
<td></td>
<td>o <a href="https://uol.de/en/neurogenetics/research/">https://uol.de/en/neurogenetics/research/</a></td>
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<td>o <a href="https://uol.de/genetik-gehirnfehlbildungen/forschungsschwerpunkte/">https://uol.de/genetik-gehirnfehlbildungen/forschungsschwerpunkte/</a></td>
</tr>
<tr>
<td>Literaturempfehlungen</td>
<td>Specific literature of the topics indicated above; original papers related to the current research question</td>
</tr>
<tr>
<td>Links</td>
<td>English</td>
</tr>
<tr>
<td>Language of instruction</td>
<td>English</td>
</tr>
<tr>
<td>Duration (semesters)</td>
<td>1 Semester</td>
</tr>
<tr>
<td>Module frequency</td>
<td>recommended in semester 4, time is flexible and subject to individual arrangement</td>
</tr>
<tr>
<td>Module capacity</td>
<td>unlimited</td>
</tr>
<tr>
<td>Modullevel / module level</td>
<td>Abschlussmodul (Abschlussmodul / Conclude)</td>
</tr>
<tr>
<td>Modulart / typ of module</td>
<td>Pflicht / Mandatory</td>
</tr>
<tr>
<td>Lehr-/Lernform / Teaching/Learning method</td>
<td></td>
</tr>
<tr>
<td>Vorkenntnisse / Previous knowledge</td>
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</tr>
<tr>
<td>Examination</td>
<td>Prüfungszeiten</td>
</tr>
<tr>
<td>Final exam of module</td>
<td>Master Thesis (90%), oral presentation (colloquium, 10%)</td>
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<tr>
<td><strong>Form of instruction</strong></td>
<td>Colloquium</td>
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<tr>
<td><strong>SWS</strong></td>
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<tr>
<td><strong>Frequency</strong></td>
<td>SoSe oder WiSe</td>
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<td><strong>Workload Präsenzzeit</strong></td>
<td>28 h</td>
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